CFTRI-MYSORE
4602
Soap manufacture

4602

1. soup manufacture
2. " stock
3. " makingplant
4. " canning
5. " processing
6. " industries
7. quick frozen soups
8. dry soup mixes
9. condensed soups

.269/61
82 50
50V

SOUP MANUFACTURE

SOUP MANUFACTURE

CANNING, DEHYDRATION
& QUICK-FREEZING

by

Raymond Binsted
&
James D. Devey, B.Sc.

Second Edition
Revised and Enlarged

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE * MYSORE *
LIBRARY
4-9-61

©

LONDON
FOOD TRADE PRESS LTD
7 Garrick Street, W.C.2

First Edition, 1940
Second Edition, June 1960

4602

CFTRI-MYSORE
4602
Soup manufacture

This book has been set in Baskerville
type face and printed in Great Britain
by Taylor Garnett Evans & Co. Ltd.
Watford, Herts., and bound by them

AUTHORS' PREFACE

OWING to the tremendous advances achieved in soup manufacture technology since the first edition of this book was published, it has been necessary to com- etely revise and re-write the original text which was the first onograph of its kind on soup manufacture in the world. The thor of the original edition has been joined by Mr. James D. evey, B.Sc., as joint Author of this new edition.

Since publication of the first edition much new technical ormation has become available and has been incorporated this new edition together with many new formulae and strations of the latest equipment and machinery for the nufacture, canning, dehydration and quick-freezing of all ds of soups.

At the time of preparing this book for press, sales of canned p in the United Kingdom were about £25,000,000 per year, ilst sales of packet soups were about £5,000,000 per year. though already big business, manufacturers and market earch organizations alike are convinced that very substantial reases in sales of all forms of manufactured soups will take ce during the next few years. In spite of the very rapid rease in production of dry mix soups in packets, sales of ned soups have been rising faster than those of packet soups ring the past six months.

Special packs of canned soups and dry mix soups and obably other forms of manufactured soups as well are finding reasing favour in the catering trade and there is little doubt t catering packs of manufactured soups will increase sub- ntially during the next few years. At the time of closing for ss it was reported that several food manufacturers had under sideration going in for the manufacture of dry mix soups and eral more were investigating the manufacture of quick-frozen ps in various forms. There is every chance that there will be more block soups available in the future as by the very ure of the product they do have special properties of their n and certain advantages for special applications.

The Authors take this opportunity of thanking the many engineers, machinery manufacturers and suppliers for the loa of photographs to illustrate this book and the descriptions an details of their equipment and products they provided, als many thanks to the Editor of *Food Trade Review* for his advic on the manuscript and arrangement of the illustrations.

RAYMOND BINSTED
JAMES D. DEVEY

May 1960

CONTENTS

apter *Page*

INTRODUCTION 1

I. SOUP STOCK 3
Ingredient Materials; Preparation of Materials; Processing; Stock Pots.

II. SOUP MAKING PLANT 14
Materials Preparation Plant; Jacketed Pans; Processing Plant; Retorts; Continuous Retorts; Can Seaming; Can Sealing.

III. SOUPS FOR CANNING 24
Soup Fillers or Thickeners; Soup Flavours; Thick Meat Soups; Vegetable Soups; Known Range of Commercially Canned and Bottled Soups

IV. SOUP CANNING AND PROCESSING 63
Filling; Sealing; Coding; Retorting; Retorting Cycle; Handling; Retorting Bottled Soups.

V. LEGAL ASPECTS 81
Meat Soups; Cream Soups; Vegetable Soups; Clear Soups; Broths; Miscellaneous.

VI. QUICK-FROZEN SOUPS 87
Preparation; Flavouring; Processing; Types of Plant and Equipment Available for Quick Freezing.

II. DRY SOUP MIXES 98
Known Range of Dry Soup Mixes Made Commercially; Raw Material Evaluation; Dehydrated Meat Ingredients; Dehydrated Vegetables; Peroxidase Test; Catalase Test; Microbiology of Dehydrated Vegetables; Starches and Thickeners; Salt and Flavourings; Herbs and Spices; Colourings, Acids and Alkalis; Fats; Protein Products; Sugars; Milk

Chapter *Page*

Products; Formulation; Manufacture; Blending; Packaging; Quality Control; Development; Formulae and Working Instructions; Plant and Equipment Required.

VIII. CONDENSED SOUPS 150
Formulation; Formulae and Working Instructions.

IX. FUTURE DEVELOPMENTS IN THE SOUP INDUSTRY 157

BIBLIOGRAPHY 161

USEFUL TABLES AND DATA 162

INDEX 167

INTRODUCTION

IN the original edition of this book, the senior Author suggested that soup making is an art and an art of the chef, and also that there seemed to be no doubt that the popularity of soup powders at the time of writing the first edition of this book was on the wane, in face of increasingly attractive soup products in cans or bottles.

Whilst one cannot doubt that the making of good soups is a great art, there does seem to be some foundation for the suggestion that events have turned a full circle and that dried soups or soup mixes are once again in great popular demand. Of course there is still an enormous demand for canned soups but at the present time more and more very attractive dry packs are appearing in one form or another, and in addition there are a few types of quick-frozen soup.

In view of the great advances which have been made in food technology during and since the last war, and the wider range of soup packs which these have made possible, it is proposed to deal with all kinds of soup packs in this book, although the emphasis is still perhaps on canned soups.

In general, "soup making" is a most fascinating study. Soups can be made in almost infinite variety and each and every kind has its place in a well-planned menu. There can be the hot, thick and nourishing semi-stew soups, which mother makes, full of meat, vegetables and pulses; there are tasty soups, mild soups, thick soups and clear soups, almost *ad infinitum*.

In many cases, far too little attention is given to the making or serving of the right soup with a meal. After all, soup is the first or nearly the first course in most ordinary meals and its quality may make or mar the whole feast.

The actual choice of soup for a meal depends partly upon the type of meal and the purpose for which the meal is intended and partly upon the other food to be served.

Where a long meal of high-class dishes is to be served, the main consideration in the choice of soup concerns the other food to be consumed, but most gastronomists agree that in such cases the soup should always be mild in flavour in order not to ruin the palate for the dishes which follow. In addition the quantity served should not be so great as to blunt the edge of the appetite. Far too often one is served with a great plateful of highly spiced or flavoured soup before an otherwise attractive meal. On the other hand, where a lower-priced meal is being served, either at home or in a café, where the object is to fill and satisfy, the soup served should not be thin, unattractive and meagre in portion size. In all conscience, soup is cheap enough to make and a good bowl of soup makes a world of difference to a half-crown meal without adding much to the basic cost.

Whilst many café proprietors, *restaurateurs* and especially railway caterers do not seem to realize the sales value of a good bowl of soup, the reverse can be said of most housewives. In these days of high-cost food for main dishes, many a scratch meal is made to look more attractive and more lavish by the simple addition of canned, dried, or frozen soup. Few store cupboards today lack a good supply of first-class factory-processed and preserved soups although there is still perhaps some room for an extension of range and in some cases improvement in quality.

The range of canned, dried or frozen soups available today is very wide indeed compared with that of a few years ago, although there is no doubt that of the three methods of preservation, canned soups still represent the largest group. Almost all types of soups are processed and preserved by canning and almost all types could be preserved by freezing. In the main only thick or clear soups with no solids in the form of meat or vegetable garnish can be dried with real success. Solids in the form of extruded dough products of course dry well, but it is not easy, for example, to dry a piece of oxtail in such a way that it will reconstitute nicely.

CHAPTER I

SOUP STOCK

IT is generally agreed that, first and foremost, the basis of a good soup is a good stock. In the hotel or restaurant kitchen, a stock-pot is always on the range, day and night, and into this goes every available raw material in the shape of bones, chicken carcases and the like. According to the size of the establishment, there is one general purpose stock-pot in which a basic stock is made, or there are several stock-pots to hold different types of stock. However, whether there is one general stock-pot or several pots for specialized purposes, the thickness, flavour and general character of the stock will vary from day to day. Thus, partly because of varying stock and partly because of the variation in the other ingredients used, each soup will vary slightly when it is finally served. For example, the chef may make Cream Aurore or Minestrone by much the same method and with much the same ingredients one hundred times, but each brew will vary ever so slightly in character and if he is a good chef, each will be a superb creation in itself—one fine day may be fine like another, but no two days are the same.

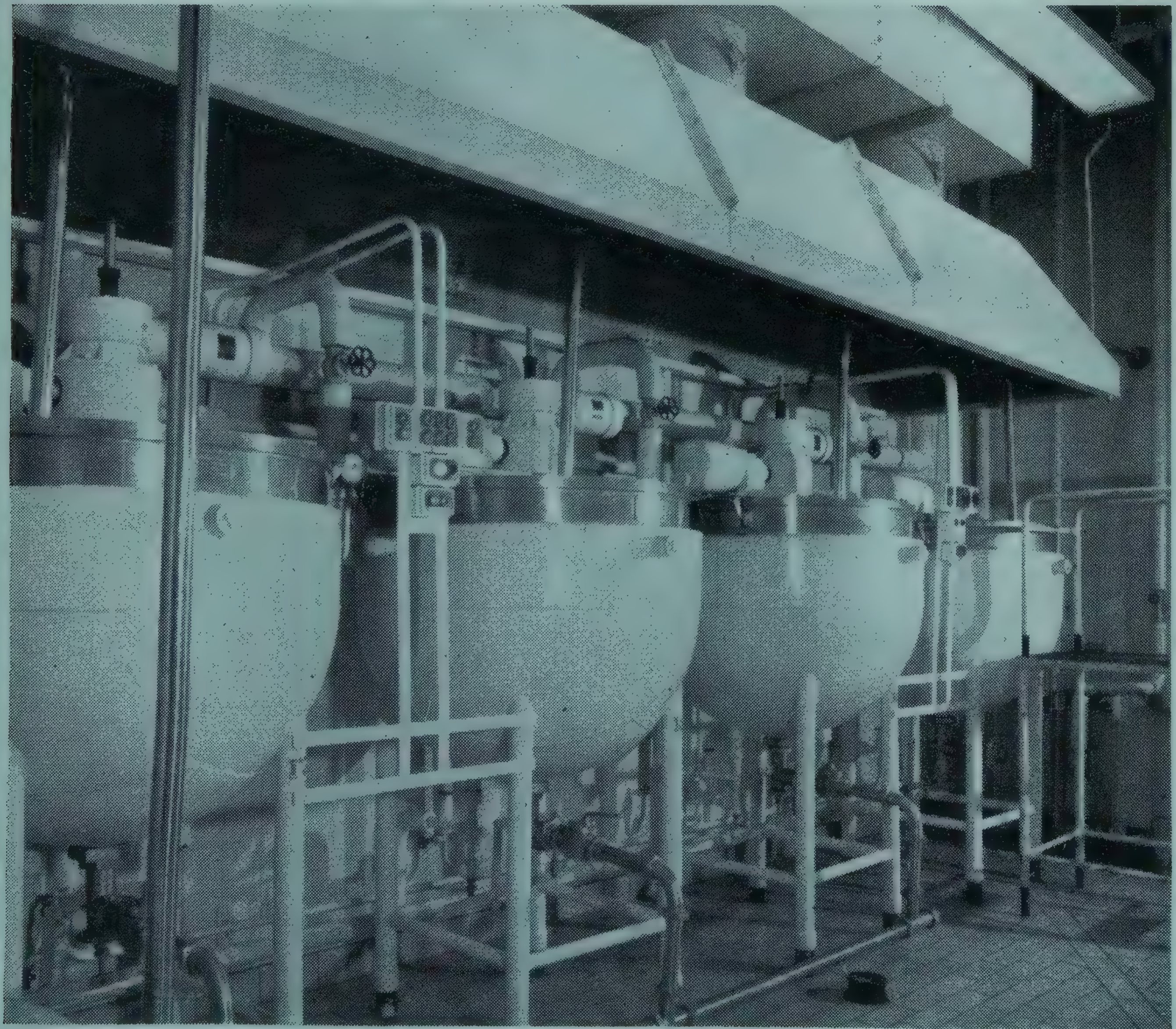
Whilst the chef in the hotel kitchen may be allowed to work as he wishes and create his own interpretation of each kind of soup, just as a piano player may vary the interpretation of the written music each time he plays it, such fine arts cannot be allowed rein in the soup kitchen of a big factory. It is of course true that the chef's oxtail soup may be as good on Wednesday as it was on Monday, but if it is different, the trouble will start. When soup is put into cans with the same label on Wednesday as on Monday, nobody can tell for sure that a lady will not buy two tins, in the grocer's shop, one of which was made on Monday and one of which was made on Wednesday. Thus, if the lady opens both tins and finds one a little different from the other, even though they are both very good to taste, she will begin to ask questions—why is this one darker in colour than the other, is it bad I wonder—and so on. Thus it will be seen that whilst the good methods of an hotel or restaurant kitchen may be applied in a factory, these methods must be subject to rigid control as to quality and sameness. Once the chef has devised a recipe for a given soup, nothing must be allowed to alter this, and the whole chain of manufacturing processes must be arranged on this basis.

Taking the various steps in the process of soup making one by one, it will be seen at once that the production of standardized stock is in itself a tremendous task. Indeed, the problem of controlling stock strength and flavour is such that many manufacturers of mass-produced soups do not attempt it at all, but add meat extract or other materials of standard quality and flavour, to water down to make their base. Such an operation is of course simple, but nevertheless the results are not always as good. Also, many large meat packing works have large quantities of bone and tough meat which they like to use to make stock for soup making before turning the waste into animal feeding-stuffs or fertilizer.

(*By courtesy Wm. Brierley, Collier & Hartley Ltd.*)

Battery of three stainless steel steam jacketed pans with bottom outlets, stainless steel aprons and counter-balanced lids. This type is very suitable for use as stock-pots.

In some factories where basic bone stock is used selected mixtures of bones and meat, chicken carcases or whatever may be required are simmered in large boilers holding from 500 to 1,000 gallons, as required. These pots are usually made of stainless steel with a steam heating coil of the same material. The bones and meat are usually suspended in such pots in wire mesh baskets or net bags. This method of operation, however, has several serious snags from the production control point of view. Firstly, it is very difficult to construct a stock-pot which is both easy to fill and clean, and yet which allows of a reasonable ratio of bones and meat to water. Secondly, and arising partly from the first objection, the resulting stock is not very strong, i.e. the solids are low. It is of course possible to dilute the stock with plain water to a uniform strength, but this means diluting to an undesirably low average standard. Various methods of stock making are applied with the object

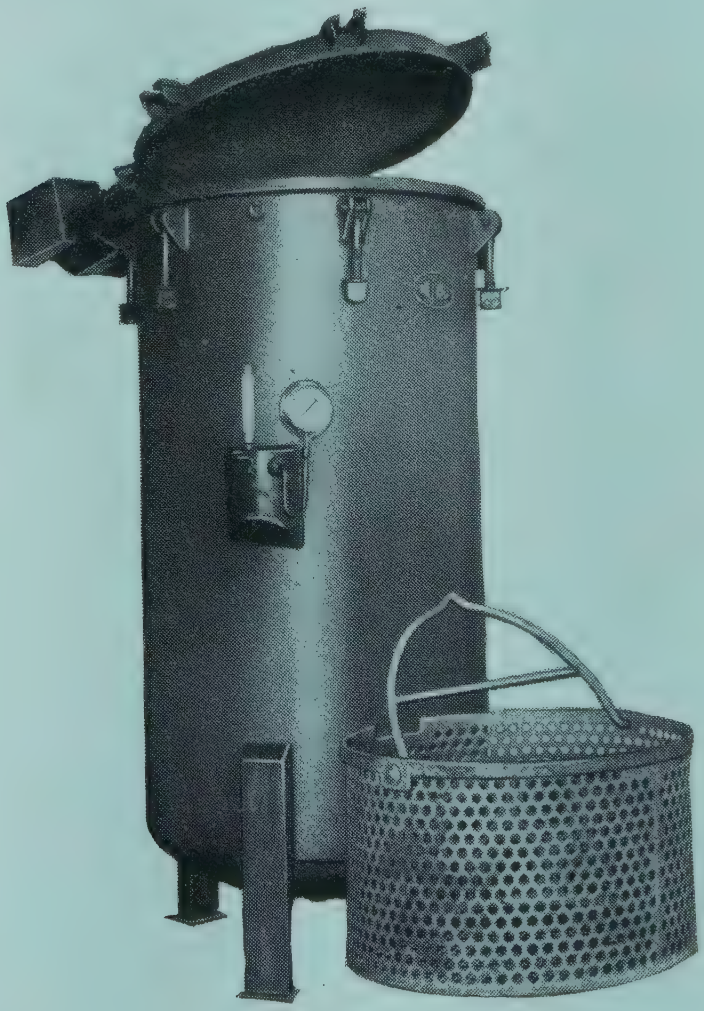


(*By courtesy The Taylor Rustless Fittings Co., Ltd.*)

Battery of four stainless steel jacketed pans suitable for making soup stocks, incorporating a very good pipe line layout and control panel. Note glass pipe lines at rear below the pans.

of overcoming the objections to the conventional stock-pot, including the retorting of the bones under steam pressure. This method is very good indeed, but unless it is done very carefully the stock may taste gluey. Undoubtedly, the best system devised for stock making is that in which the bones are subjected to elevated temperatures and pressure in a special double retort in which the bones are kept constantly under water. By this method it is possible to produce a stock with a high average solids content and yet which has an excellent flavour. This high-solids stock can then be diluted with hot water, to a solids content just below the average figure, so that quality can be maintained the same day after day.

It must of course be understood that good soup stock requires other ingredients beside meat or meat and bones. In most cases some sort of vegetable is added to the stock, together with a few herbs and spices. Further, some stocks are made from vegetables only, and as vegetables cannot be handled easily by the pressure cooking method described above, it is always really advisable to have large stock-pots, even when the pressure method is used.

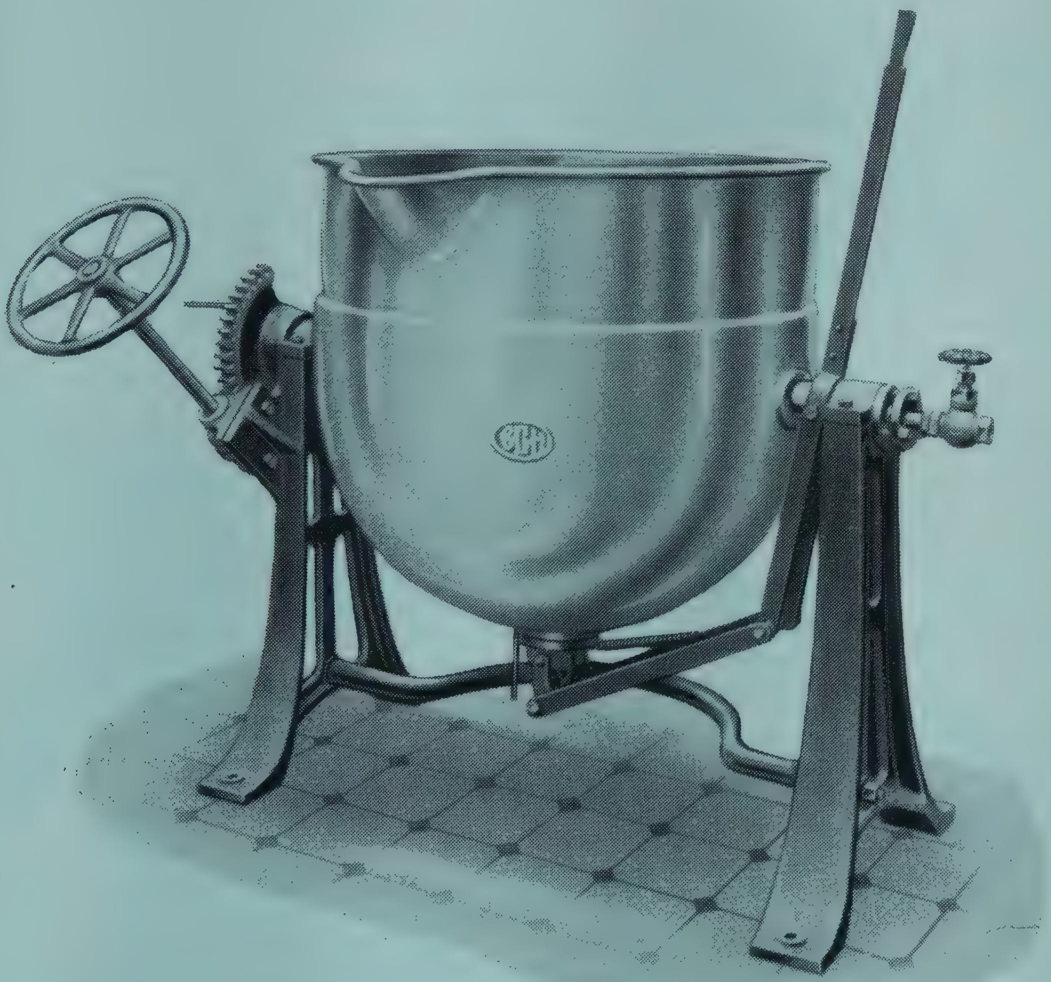


(By courtesy John Fraser & Son Ltd.)

A "MILWALL" VERTICAL RETORT AND ONE OF THE BASKETS.

Where the ordinary stock-pot method of making stock is d, most stock recipes call for the addition of vegetables or bs towards the end of the simmering period, so that in the case these are added to the stock which is already in the t, whilst in the other case, the standardized stock from the ssure cooker is run into the stock-pot for further cooking th the vegetables. Thus, even where the special stock-making tem is used, it is not possible to do away with the conven- nal stock-pot.

At this stage, it is perhaps as well to divert from the theme factory production and machinery, to deal for a moment th the more culinary aspects of stock making. There are ur main types of stock, at any rate so far as commercial soup aking goes. These are brown meat stock, white meat stock,



(*By courtesy Wm. Brierley, Collier & Hartley Ltd.*)

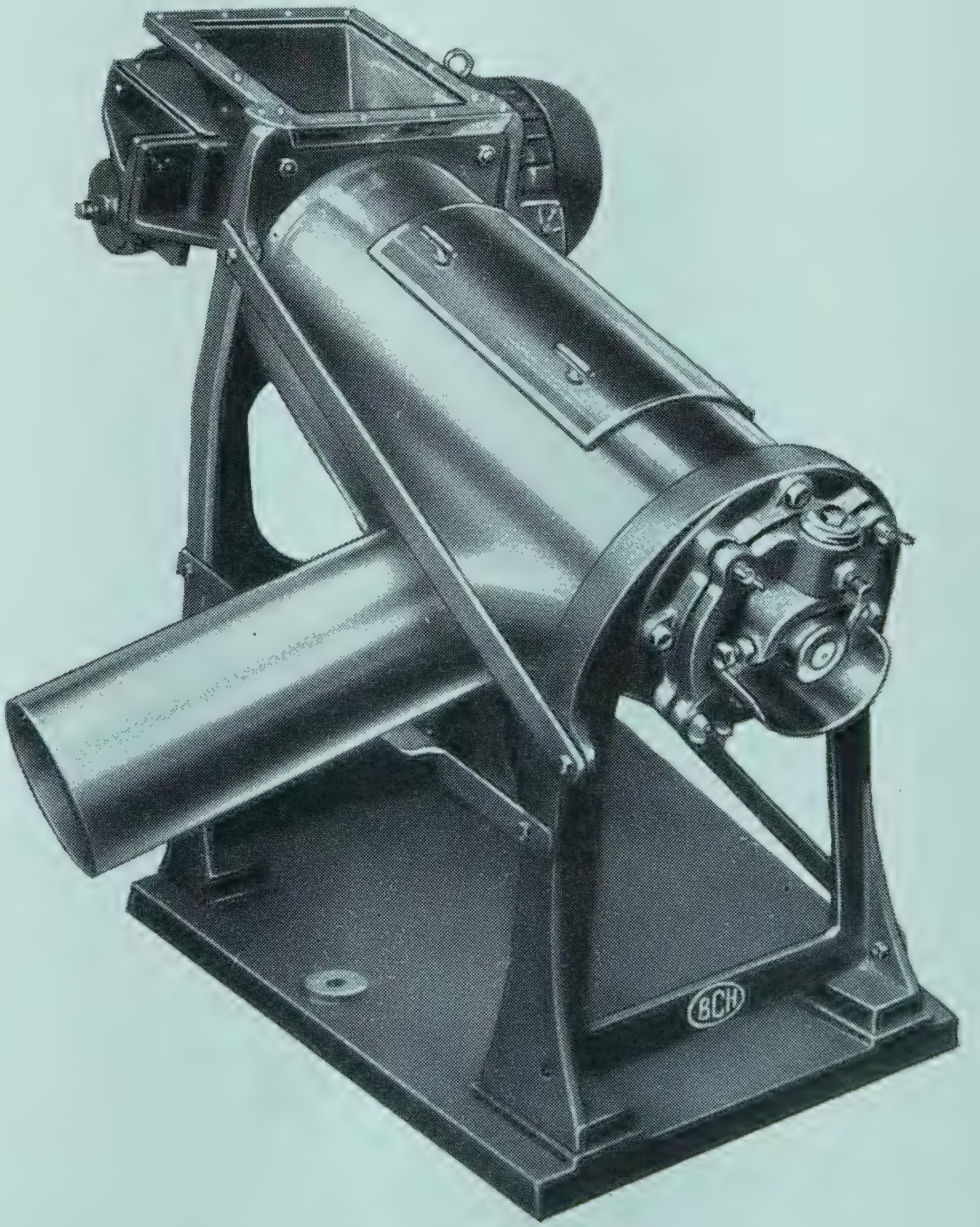
velded joint stainless steel boiling pan arranged with quick opening bottom let valve and worm and wheel tilting. This pan is steam jacketed and of 100 gallons capacity.

getable stock and fish stock, the last of which is not very portant, at any rate for canning. These basic stock types can sub-divided into various kinds, e.g. you can have white or own game stock and so on. There is also a special stock,

which is really a soup from the beginning, not a stock, and th
is of course the clear base for consommé.

General brown meat stock is usually made from bones an
lean beef meat, the more meat the better the stock. The bon
should be well cracked up and some high-class cookery boo
will tell you to remove the marrow. Obviously, however, th
cannot be done in commercial soup making on a large scal
The best machine for cracking the bones is a bone crusher
the waste disposal plant type. This machine consists of tw
rollers with spikes in them, between which the bones are fe
from a chute. In small factories, the bones may be broken u
by hitting them with the back of a chopper.

For some brown soups, e.g. oxtail, which require to b
tasty and to have that roast meat flavour, the bones may b



The B.C.H. sieving or straining machine made with capacities of one, two or three tons per hour. Machine is of stainless steel and has interchangeable sieves of various meshes. Fitted with Nylon brushes and can be arranged with a discharge on either side or vertically from the bottom.

ghtly roasted in a large oven. This has the advantage of ndering out some of the fat, but great care has to be taken prevent burning as this leads to black flecks in the soup.

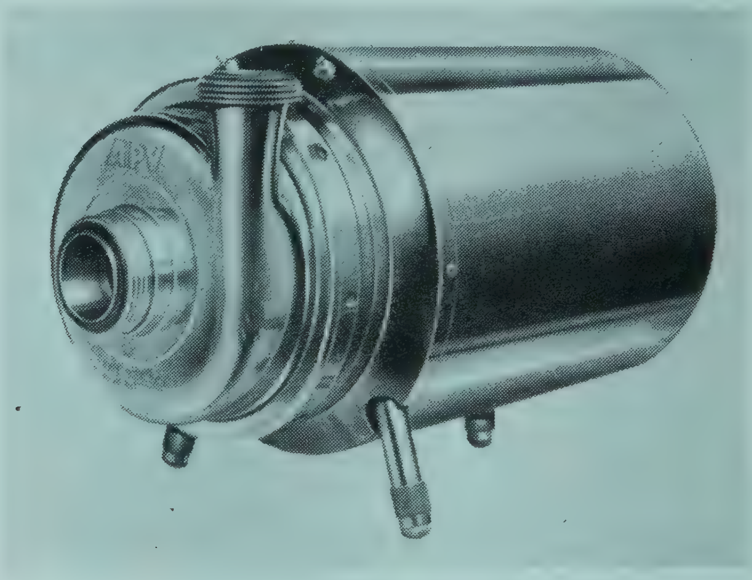
It is very difficult to give any exact recipe for the stock as much depends upon the availability of raw material, the osting basis and so on, but as a starting point it can be said hat one pound of meat or bone to the pound of water is good. n the same way one can say that, for ordinary brown meat ock, you should add about 25 lb. each of carrot, turnip and nion and 12 lb. of celery, per 100 gallons of stock. Herbs and pices are added to taste. Of course, the water to meat ratio vill alter when the pressure stock making method is used, but he amount of vegetables will not, because these are added fter the stock has been put into the stock-pot.

A B.C.H. rectangular bogie with stainless steel pan of 20 gallons capacity.

White stock is usually made from veal or calves' heads or, vhere certain special soups are being made, poultry or rabbit nay be used. White stock is not so easy to make by the pressure nethod, although with care it can be done. About the same uantities of vegetables are used for this type of stock.

Vegetable stock cannot be made in the pressure cooker nless it is to be used for making the thick purée type of soup. n this case, certain soups, e.g. carrot soup, are improved by his method of treatment.

The best vegetable soup stock recipes, especially those designed for use in soups in which the vegetables are left in whole pieces as in ordinary vegetable soups, suggest that the vegetables should be fried in butter until golden brown, before putting into the stock. Unless butter is very cheap, however, this is not an economical procedure, and in any case it is not easy to use the stock vegetables in the final soup. This is because it is almost impossible on a large scale to remove the diced vegetables from the stock-pot and place these evenly in the cans or other package. On a commercial scale, vegetable soup stocks are best made from diced vegetables, which are afterwards thrown away or used for some other purpose.



(*By courtesy The APV Co. Ltd.*)

An APV stainless steel centrifugal pump suitable for pumping soup stock or finished soup,

Fish stock is not very generally used, but has some considerable possibilities for freezing. This will therefore be dealt with under the special heading of Quick-Freezing.

Whatever the type of stock being made, the general procedure is as follows:

1. Prepare the raw materials, meat or vegetable.

2. Convert the meat part of the raw materials into stock by simmering, never boiling, in the stock-pot, or by the pressure method. When the stock-pot method is used, the scum should be skimmed off the top of the pot from time to time—a hand-bowl on a broom handle is very useful for this. Once the basic stock is made, it should be standardized and in the case of the pressure method, run into the large stock-pot. The vegetables and salt, if any, are then added and simmering continued until the desired stage is reached.

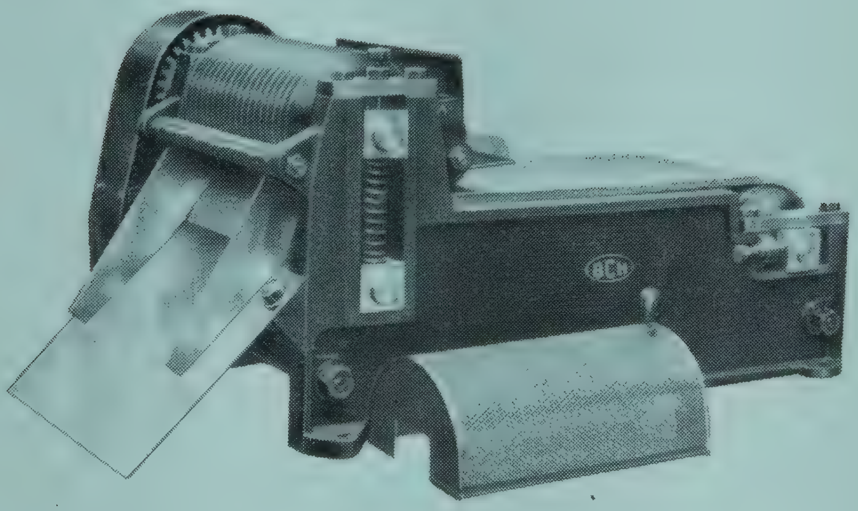
At this point, most cookery books will tell you that the stock should be cooled to allow the fat to come to the top, and also that all but vegetable stocks can be kept from day to day by means of leaving the hard fat crust on the top. This definitely does not hold good for commercial soup stocks which are to be used for canning or especially freezing. However hard you may try, soup stocks cannot be kept cold in a big factory soup kitchen. Unless refrigeration is used, and the stock is in fact kept very cold (below 40° F.), the bacteria count will increase and cause trouble in the final retorting process where the cans are sterilized. The question then is, is it worth while cooling off the stock at all, merely to get the fat out? The answer to this is that it depends upon the type of soup to be made. If it is a thick soup, then the fat is useful and will blend into the thickener used. If on the other hand the soup is to be of the clear type, then the fat has to be got rid of or it will settle on the garnish and look very bad.

(*By courtesy Wm. Brierley, Collier & Hartley Ltd.*)

A continuous chopping or mincing machine for vegetables. Made in stainless steel, this machine can be fed continuously from the top and discharges continuously through the bottom. Output one ton per hour.

Quite a lot of fat can be got rid of in the hot stage by skimming, but if soup requiring an absence of fat is to be made on a commercial scale, then there is no doubt that it pays to put in a machine separator.

Where soup has to be made very clear, the stock has to be clarified, and this again may be done by machine, in fact one machine can be obtained to take out both fat and small solids. That is to say, after the bones, meat, vegetables and bags of spices, if any, have been removed from the stock, it is run out into another vessel, through a centrifugal separator.



675

(*By courtesy Wm. Brierley, Collier & Hartley Ltd.*)

A continuous cutting machine for celery, noodles, etc.

Where only small-scale operations are undertaken, the stock can be clarified in a settling tank by means of eggs or isinglass, and some chefs use coffee grounds for this purpose. Where eggs are used, it will take the whites and shells of three or four eggs to clear each gallon of stock and this is obviously expensive. Where isinglass is used, the clarifying agent must be prepared beforehand, by covering about 5 oz. of best isinglass with cold water and allowing this to stand for 7 or 8 hours. At the end of this time, the water is drained off and the swollen isinglass put into about a gallon of cold water into which 3¾ oz. of tartaric acid has been dissolved. Stir well, adding more and more cold water until three gallons has been produced. No heat should be used in this process and the resulting liquor will be a smooth and rather heavy syrup, entirely free from lumps.

If the actual stock-pot is to be used for clearing the stock, then it should be fitted either with a floating draw-off pipe or a series of pet cocks down the side, so that the clear liquor between the top scum and the bottom mud may be drawn off easily. Alternately, a special vessel may be used.

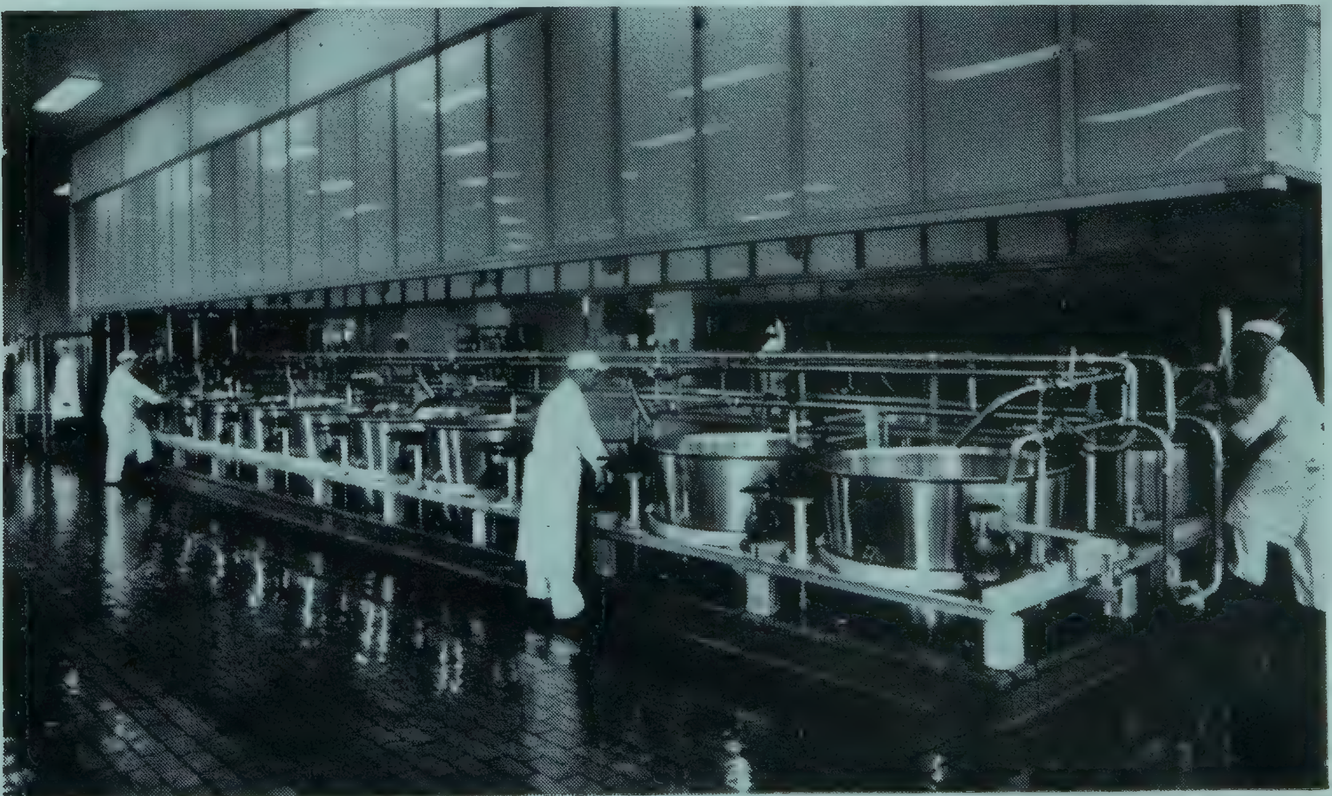
At this stage, it should perhaps be emphasized that the validity of many of the points made heretofore depends very largely upon the scale of operations undertaken. For example, whilst we have said that it is difficult to use the diced vegetables which have been used for stock to garnish finished cans of soup, this does depend upon the scale. If only a very limited production is being handled and small pans are used with hand filling, then such things are possible. As a general rule, it is possible to do almost anything where the scale is very small or again where it is very large, because in the one case hand methods are used and in the other all sorts of pumps, pipes and other apparatus can be installed, just to make one particular kind of soup. It is always where semi-large-scale operations are undertaken that difficulties arise with the volume of raw material which has to be handled in many differing ways without large capital expenditure on plant.

CHAPTER II

SOUP MAKING PLANT

WHILST for small-scale operations, all the various phases of soup making and canning may be carried out in one room on one floor level, there is no doubt at all that for large-scale operations, one or two floors are most desirable. Stock-pots are of necessity rather large and high and if these are standing on the floor with sufficient clearance for drainage cocks underneath, then they are very awkward to charge with raw materials. It is therefore desirable to have them let into an upper floor with a discharge pipe in the room below. Actual soup making can then be carried out below, together with the canning, or this last operation can be put on a lower floor still. In view of the fact that soup making is almost certainly carried out in a factory which makes other foods as well, the layout must really depend upon how soup production fits in with the other foods being made.

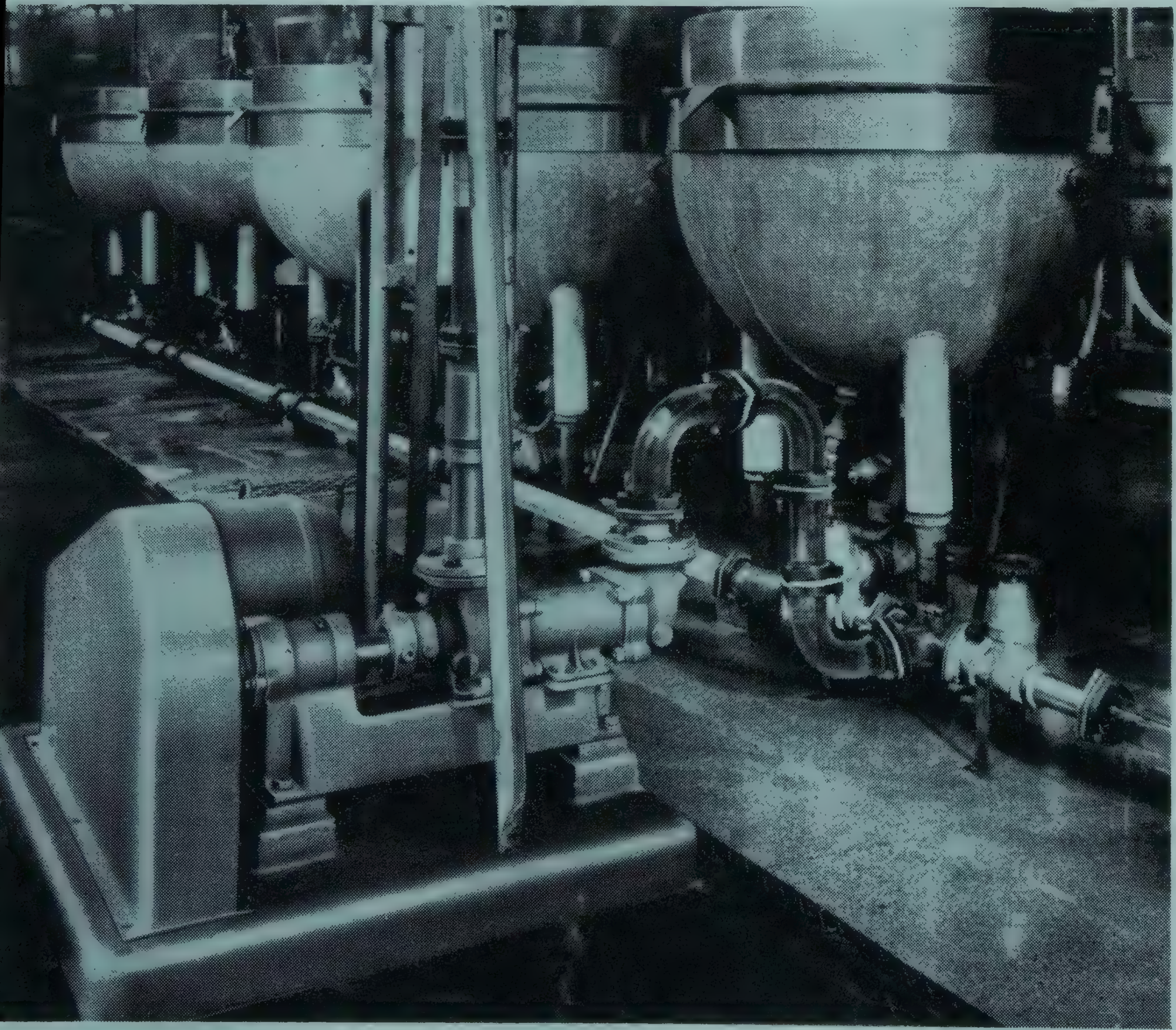
Stainless steel is the best material for soup stock-pots, but there is no need to have a heavy material, because the pots



An impressive view of the specially designed stainless steel jacketed boiling pans in the Soup Preparation Department of a very large soup cannery in England.

may be heated by steam coils and do not therefore need to withstand the pressure of a steam jacket.

Stock for soup making may be drawn off from the stock-pots by means of a bottom draw-off valve and filled into buckets for transfer to the soup-making pans, or it may be piped by gravity or pumped. There is much to be said for manhandling as pipes are difficult to keep clean in soup-making plants and block very easily with small pieces of bone and meat. Certainly, if pipes are used, the greatest care has to be taken to provide an easy-to-get-at strainer or filter on the outlet of the stock-pot, and the pipes must be arranged in such a manner



(*By courtesy Mono Pumps Ltd.*)

A stainless steel H60 Mono Pump used for delivering hot vegetable stock from he jacketed boiling pans to the can filling machine. Normal pump speeds are 300 o 450 r.p.m. for capacities between 360 to 480 gallons per hour. Glass pipe lines re incorporated in this particular installation.

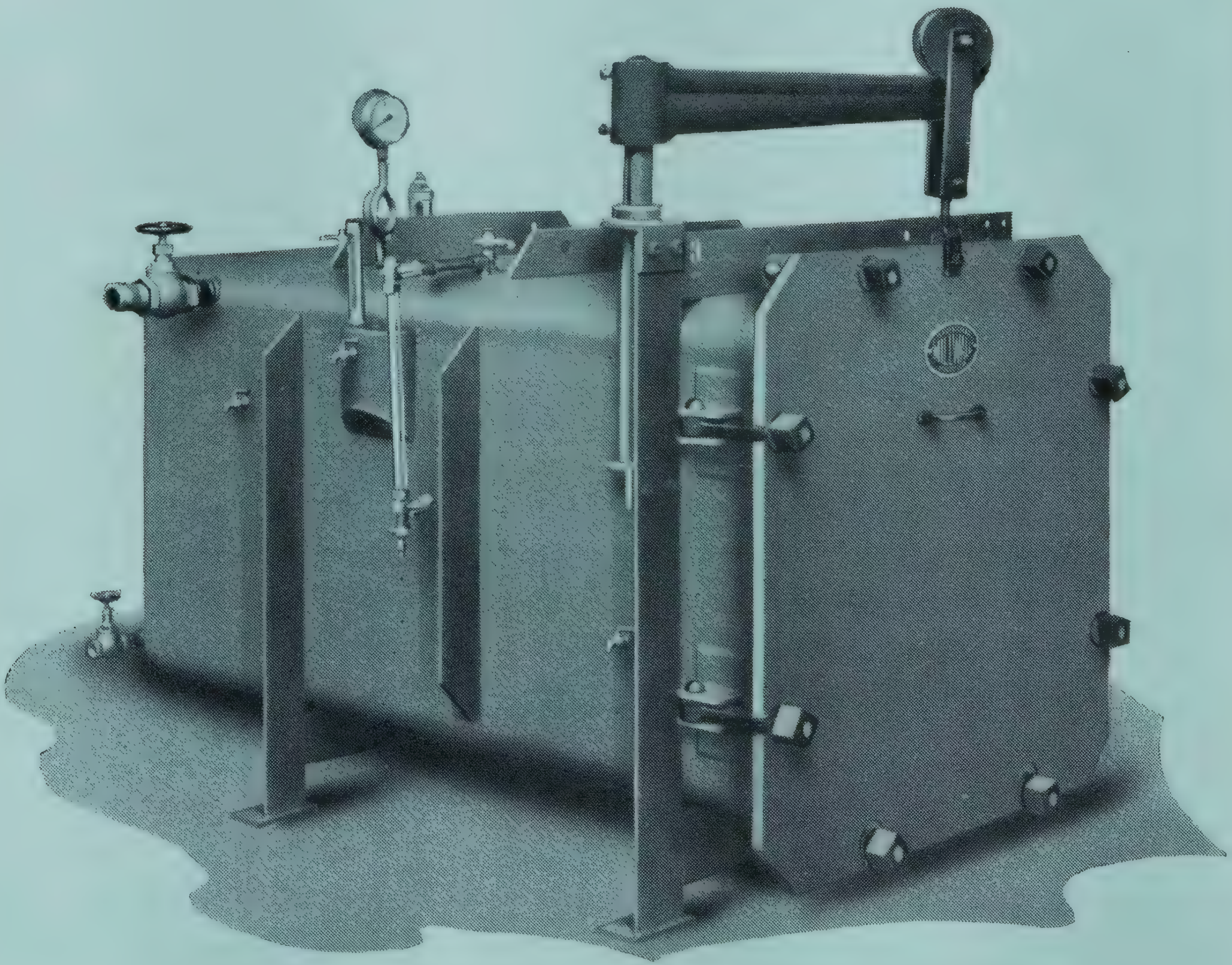
When the Mono Pump is in operation, the rotor and stator engage with one nother in such a way that cells or chambers of constant shape and volume are being progressively created with uniform speed. This unique principle of operation enables the pump to handle semi-solids in suspension, such as diced vegetables or peas in liquid.

that they can be taken down for cleaning every day. The set-up in this respect should be on the same lines as an ice-cream factory and indeed ice-cream pipes and pumps are ideal for this work. It is also a good idea to have both fresh water and live steam inlets in the pipe system at various points so that the lines can be sterilized and flushed during working hours.

Stainless steel steam-jacketed pans are usually used for the actual blending of soup. These should be as large as possible to save labour by increasing batch sizes, but not so large as to make the finishing of batches too intermittent. The size must therefore be reasonably balanced with the production rate.

Besides steams pans, the following items of equipment are required for anything other than very small production:

A horizontal or vertical steam pressure cooker or retort, fitted with deep stainless steel trays, which should have loose-fitting lids. This item is most useful and is used for pressure cooking items such as ox tails, chickens and so on. The foods

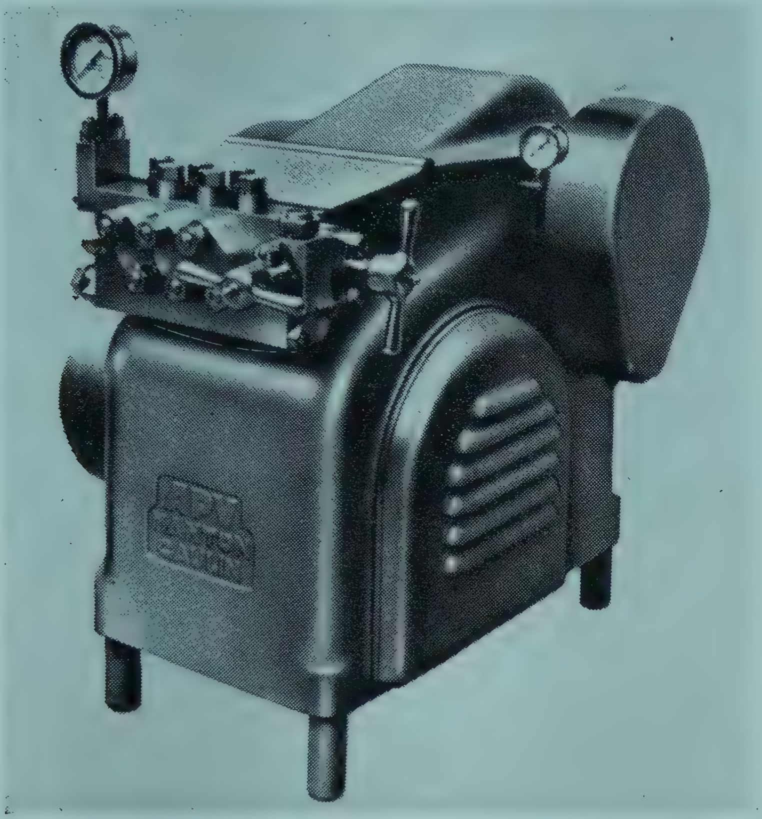


(*By courtesy John Fraser & Son Ltd.*)

A "MILWALL" HORIZONTAL RETORT.

are placed into the trays with a little stock and covered so that steam does not condense into them.

One or more gas, electric or coke-fired baking ovens and a supply of deep stainless baking or roasting trays. These ovens are used for browning flour, roasting meats or vegetables, cooking rice and so on.

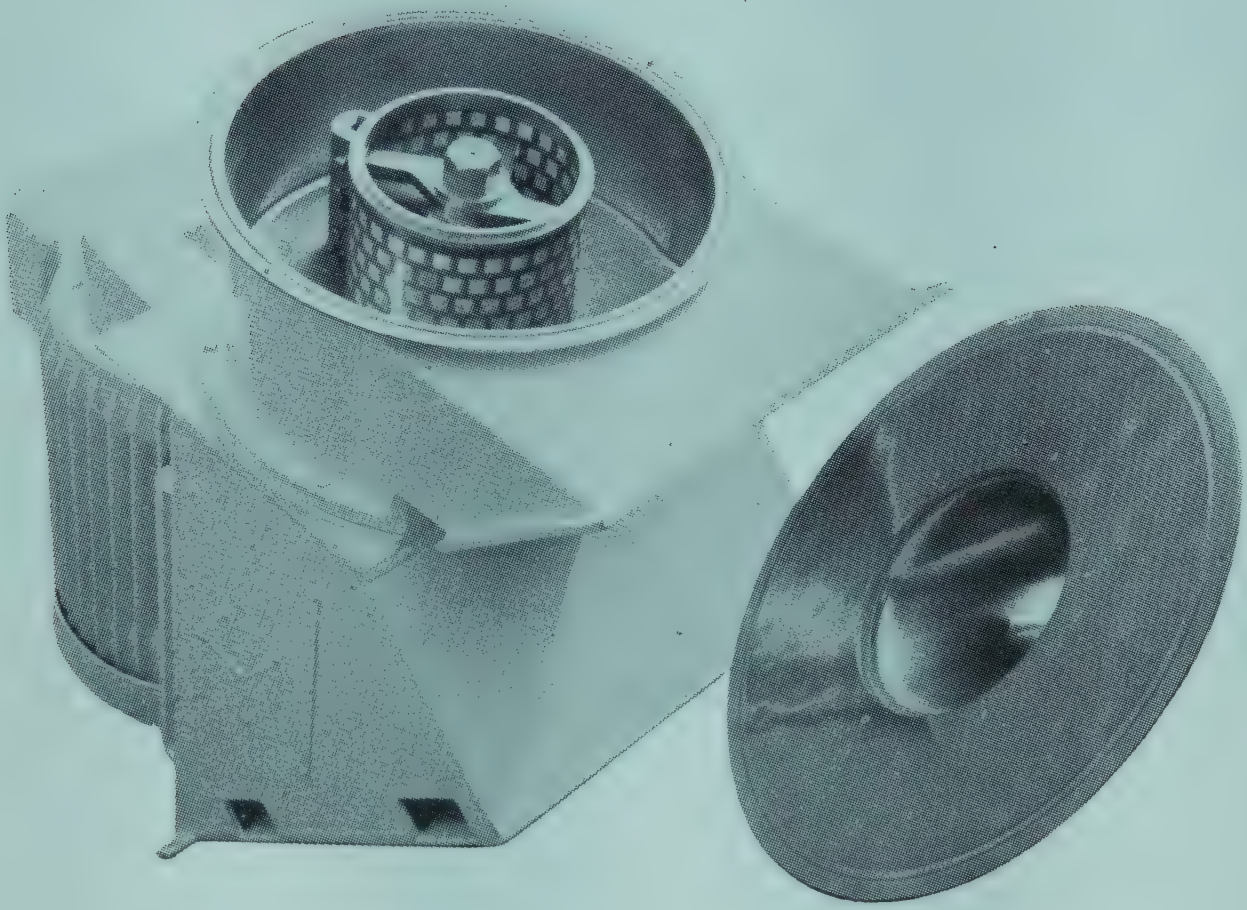


(*By courtesy The APV Co. Ltd.*)

APV Manton-Gaulin homogenizer suitable for soups, etc.

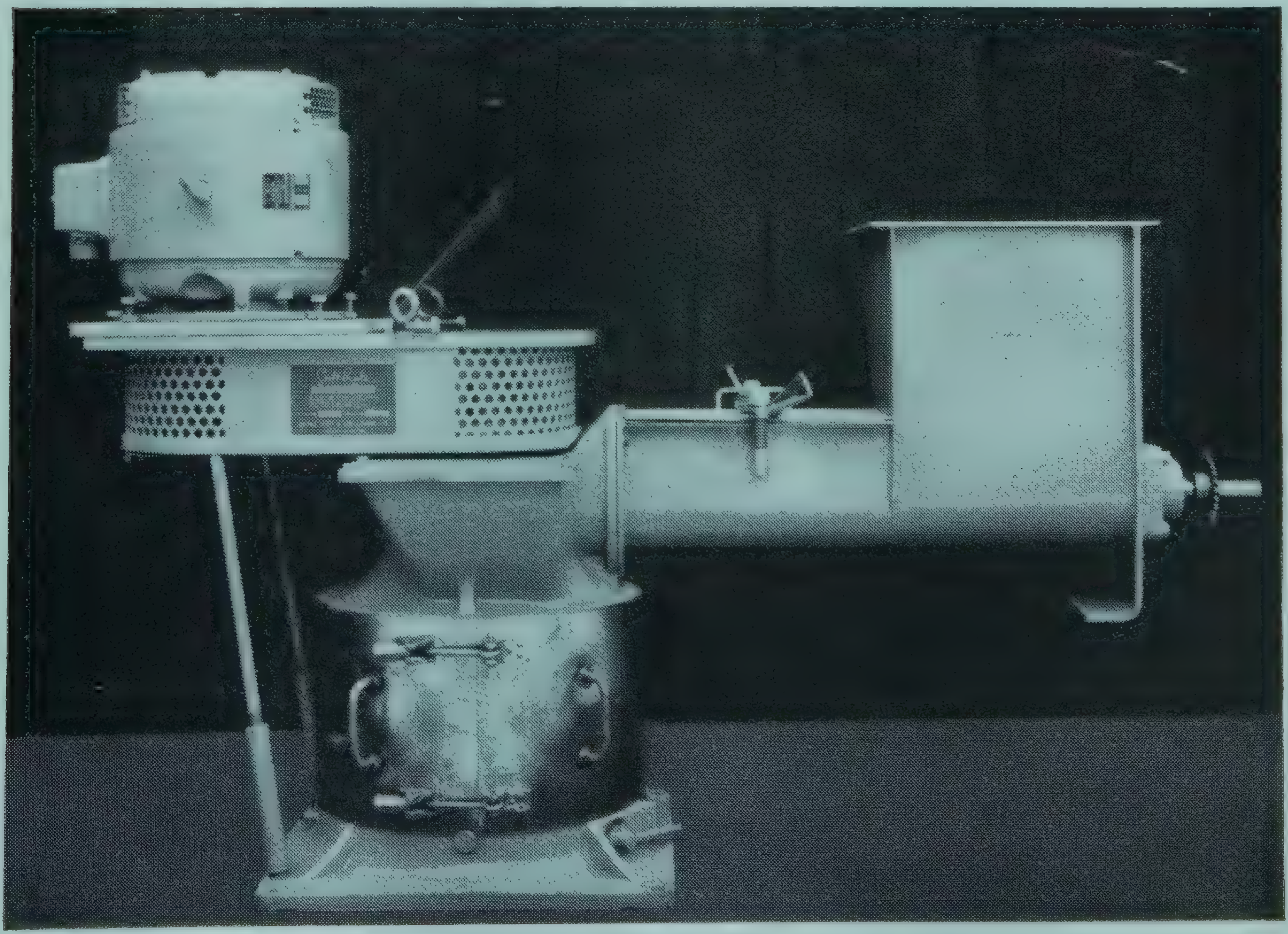
A motor-driven pulping or sieving machine, fitted with interchangeable stainless steel sieves of various mesh sizes and with an oversized motor. This machine is used for sieving vegetables for purée, and also for removing meat from small bones. If, for example, cut-up cooked rabbit, chicken or ox tail is fed slowly to such a machine, all the meat will be removed from the bones in the form of a fine purée. For this operation, however, it is desirable to have an oversized motor.

The soup may be given its final "gloss" before canning, by running it through a fine-mesh pulper, as above, but these machines are not entirely suitable for this work. It has been found much better to use a very rapidly vibrating screen for many soups, or alternatively an "in-vat" type emulsifier. For a small factory, an ice cream type in-vat emulsifier is most useful as it may be removed from one pot to the next, but in a larger establishment it is desirable to have both an emulsifier and a

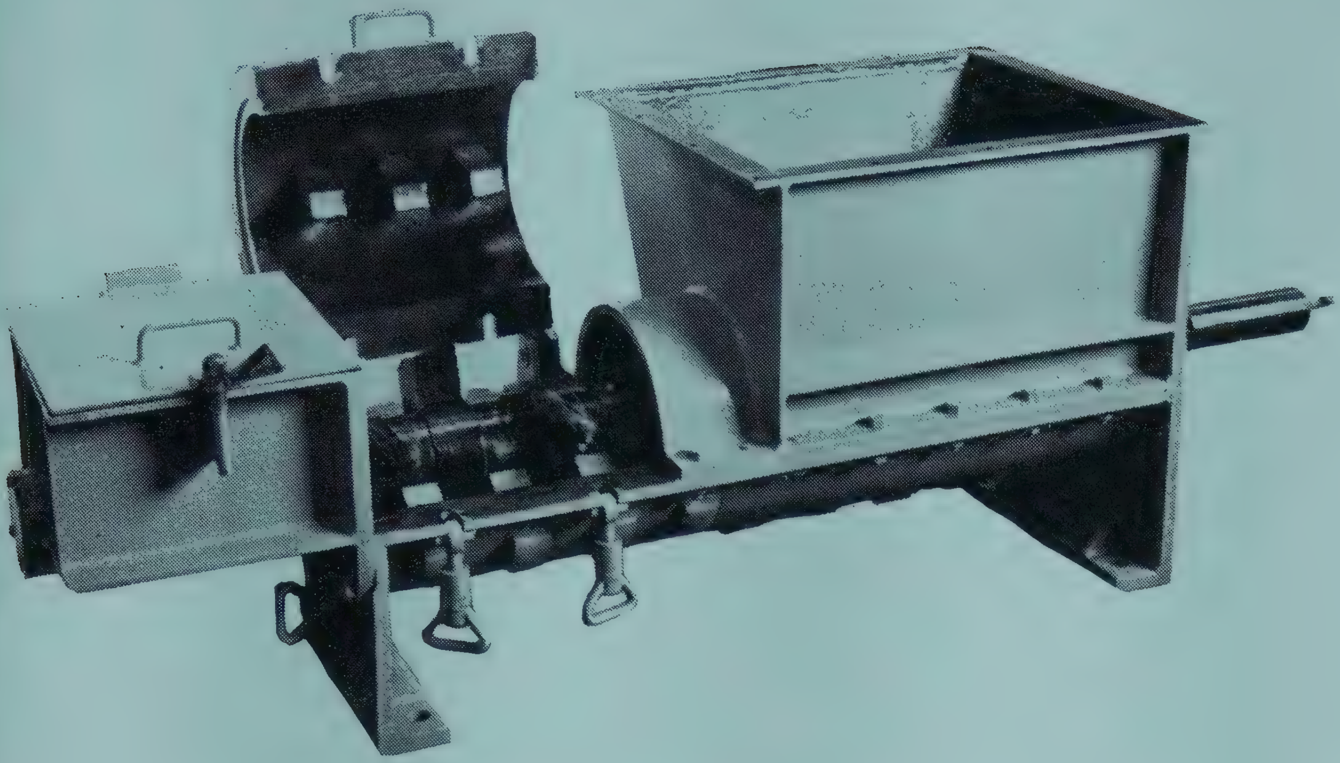


(By courtesy George Scott & Son [London] Ltd.)

A Scott-Rietz angle disintegrator with the cover removed.



A Scott-Rietz vertical disintegrator coupled with a prebreaker feeder with all contact parts made in stainless steel.



A Scott-Rietz sanitary prebreaker open to show ease of cleaning.

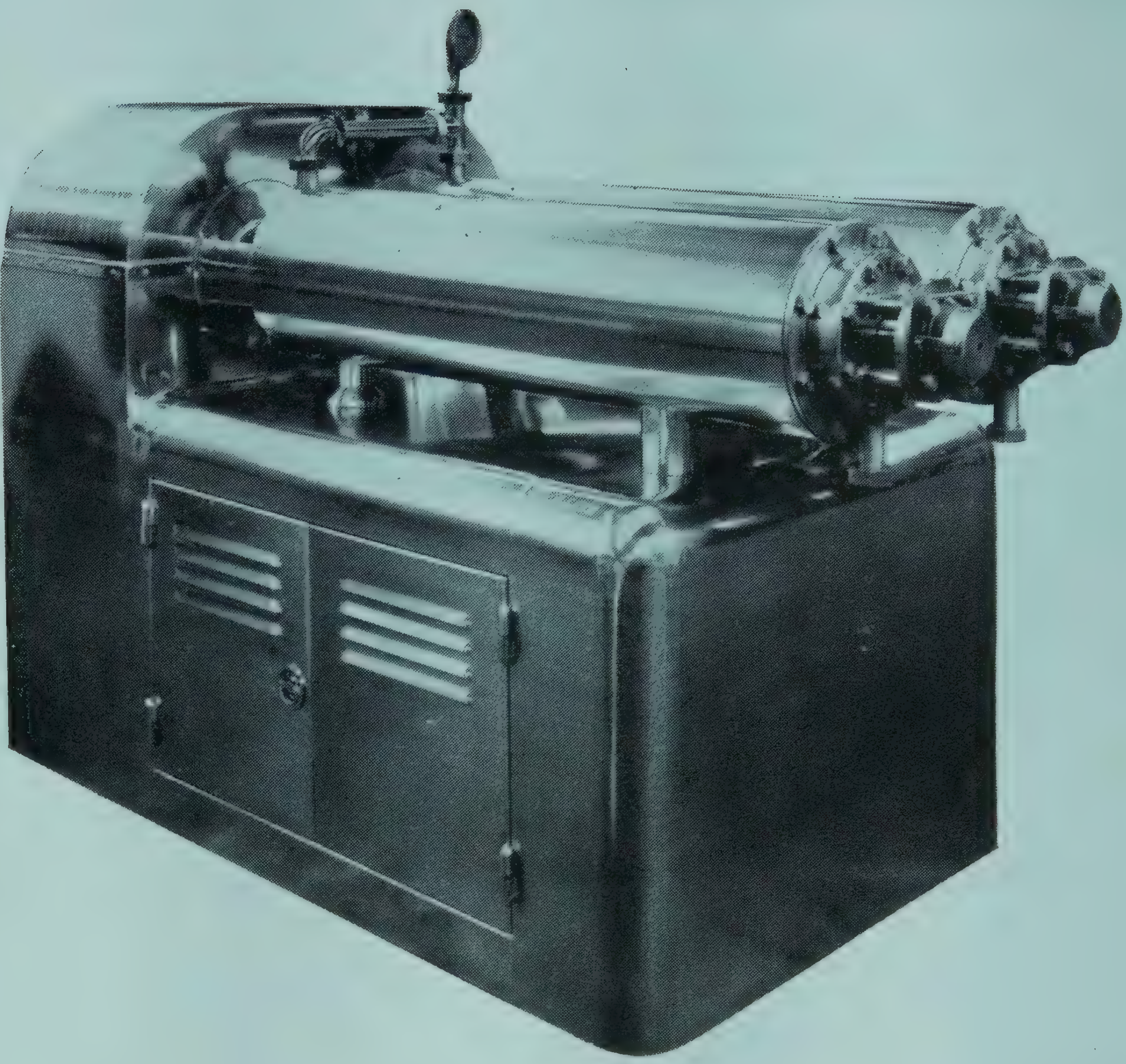
final vibrating screen, which acts as an inspection table, before the soup is passed to the fillers.

A vertical whisk or cake mixer is usually used to make up batter for thickening purposes, and an ordinary baker's type mixing machine is quite suitable. It is, however, desirable to have a warm-water feed to the machine, with a device for measuring standard quantities into the bowl, as most cereals mix much more freely if the water used is slightly warmed.

Besides the above-mentioned main items of equipment, the kitchen should have an ample supply of stainless steel buckets and bogies, scales, knives, spoons, paddles and so on. Also, in an ancillary department, it is necessary to have vegetable washing and cleaning plant, vegetable dicers and so on.

The plant required for the actual canning operations is dealt with in another chapter, but the main requirements are a can feed conveyor for filling in solid garnish; a soup filling machine; a can sealer; followed by a can washer; a number of steam retorts and crates to go in them; means of cooling the cans, although this is often completed in the retorts, a labeller, and possibly a can caser and sealer.

Steam vapour removal and floor drainage are two major problems in the soup kitchen and the cost of the latter is often overlooked when calculating installation costs. Stock-pots and pans should all be fitted with overhead steam removal cowls as

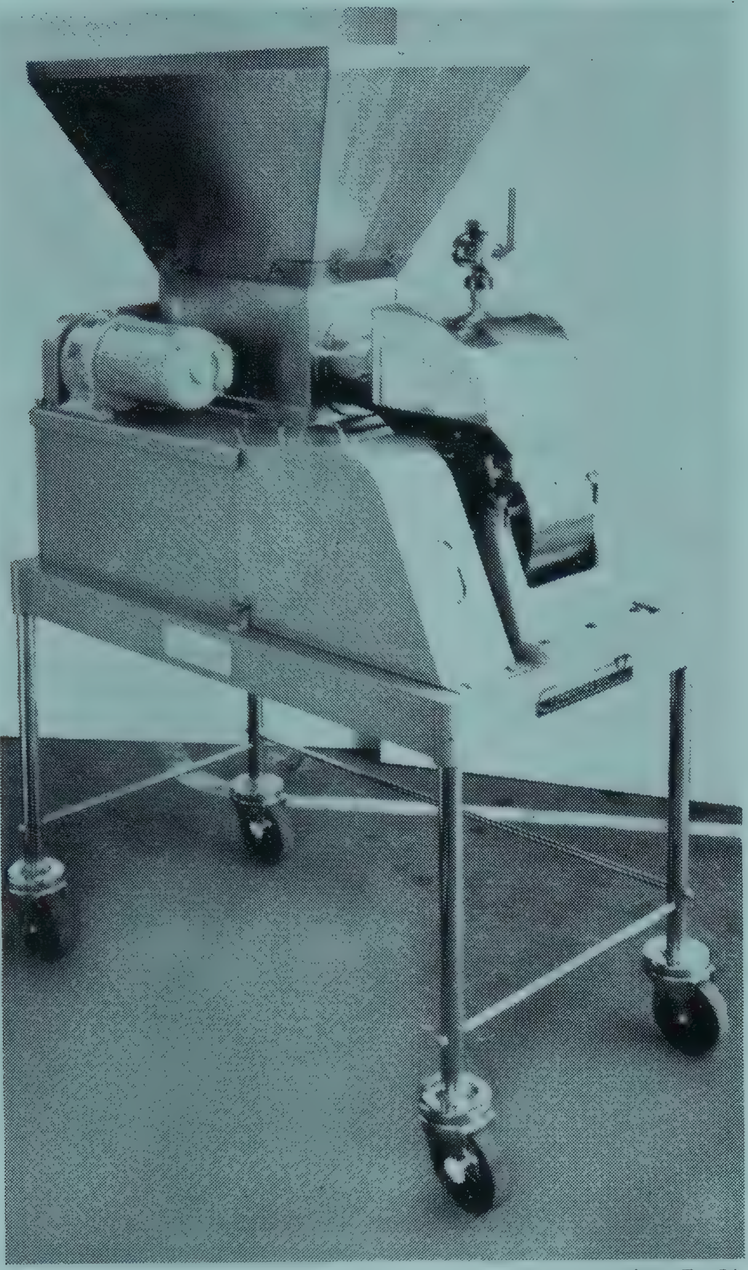


(*By courtesy A. Johnson & Co.* [*London*] *Ltd.*)

A twin cylinder 6 in. by 48 in. Votator processing unit for soup cooking. The cylinder is jacketed for steam. All contact parts are of stainless steel except the scraper blades which are of plastic material. Capacity is up to 3,000 lb. per hour.

the amount of steam given off is considerable. These cowls may be of the natural draft type or connected to ducting and fans. There are one or two exceptionally good natural draft ventilator hoods available, although these are usually made of wood which is difficult to keep clean. Where ducting and fans are used, a problem does arise from corrosion arising from vinegar fumes, especially if the same plant is used to make sauce or spiced vinegars, etc.

There is no doubt that floors are best constructed of special tiles which last longer than straight concrete, but they do of course cost a lot more. Most newcomers to the food manufacturing trade make the grave error of planning drainage points in the floor, from which the water is removed by underground pipes. This is a serious mistake and inside any meat works the drains should be in the form of open channels cut in



(*By courtesy Apex Construction Ltd.*)

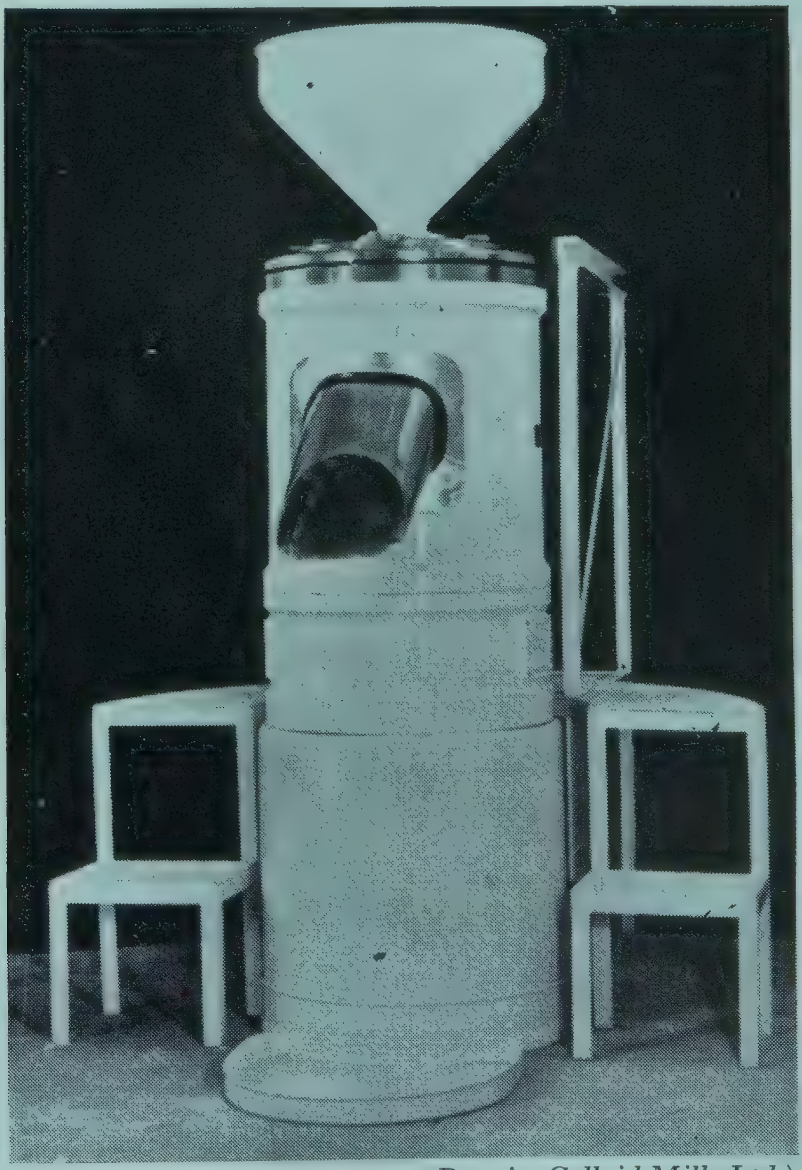
An Apex comminuting mill for size reduction of vegetables into a smooth consistency and other applications in soup manufacturing processes. All contact parts are in stainless steel.

the floor, about 9 in. to 12 in. wide and varying in depth according to the fall. These channels should fall to a common exit from the room and should then feed into a grease trap in the form of a series of separation tanks. The channels themselves should be covered with perforated steel covers set in steel angle iron let into the floor, so that they can be taken up every night and brushed clean. It is best to use perforated steel plates, rather than fabricated bar grid gratings, as although these cost less in the first place, they do cause a lot of trouble with trolley wheels. If proper grease traps are installed, a lot of waste fat can be recovered and rendered for sale as technical grease.

Where there is an excessive amount of spillage in any one area of a department, it is wise to have the floor specially drained in this area, and surrounded with a little tiled kerb, to prevent the water spreading. In certain cases where no one walks on the area in question, fat wastes can be removed by separation and used for food purposes.

The use of colloid mills for the production of soups is a well-established process. Generally, in the manufacture of cream soups, it is necessary to carry out two operations with a high speed mill—one is the smoothing out of thickening agents such as flour, and the other the emulsification into the soup of the fats which have a tendency to separate in certain cases in storage. While in actual fact these are the two operations which are carried out by high speed milling, the end effect is to produce a product which is smoother to the tongue.

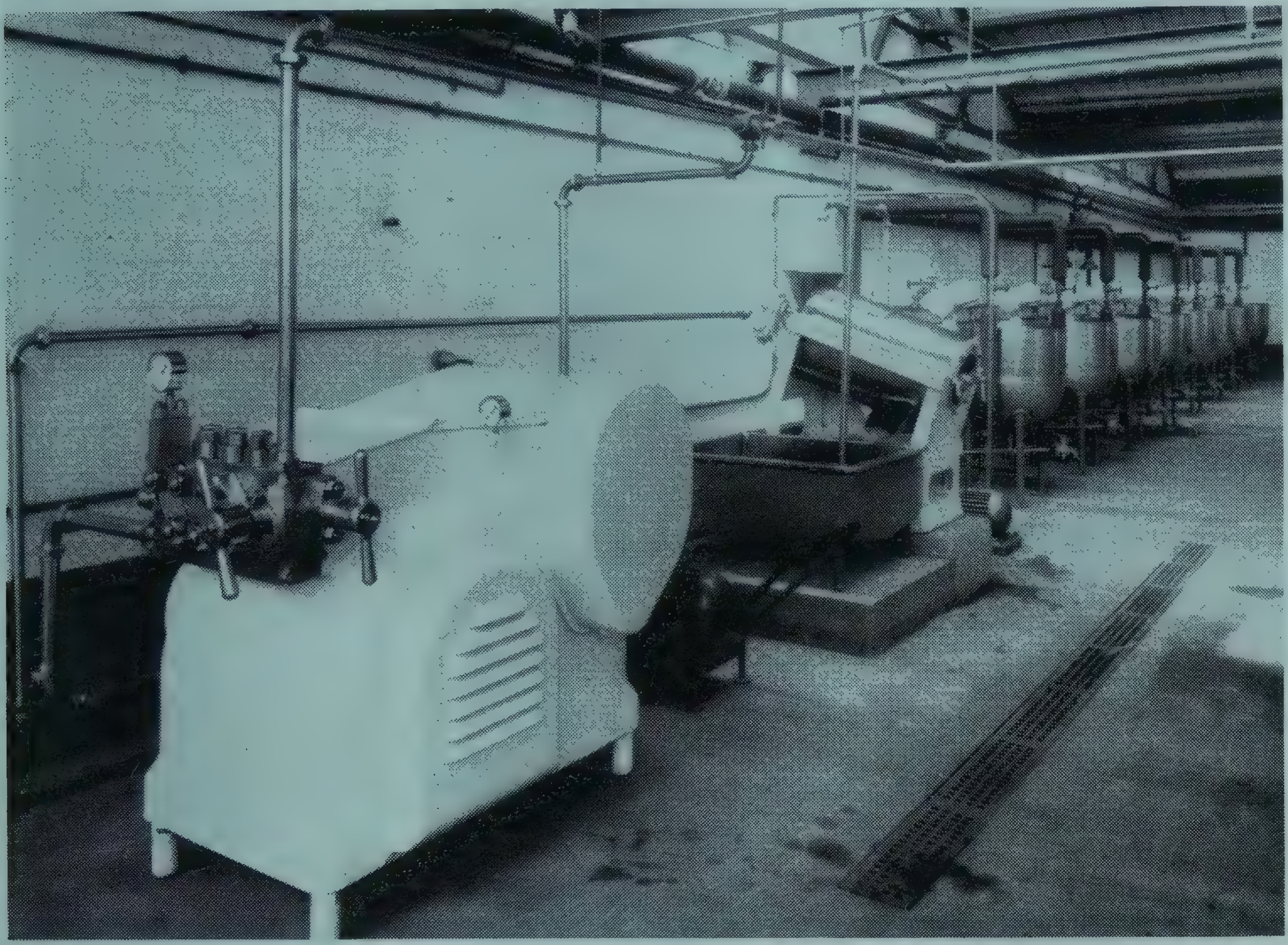
In certain cases it may be necessary at the same time to grind into certain soups vegetables or meats, and in these cases colloid mills which have abrasive type working surfaces are



(By courtesy Premier Colloid Mills Ltd.)

A typical high speed colloid mill suitable for use in soup manufacturing processes.

better suited to this type of work since they will grind solid particles to a smooth cream and at the same time homogenize and disperse other products in the soup.



(*By courtesy APV Co. Ltd.*)

APV steam jacketed pans, pulping and sieving machine and an APV Manton-Gaulin homogenizer at the soup kitchen of the C.W.S. factory, Lowestoft.

CHAPTER III

SOUPS FOR CANNING

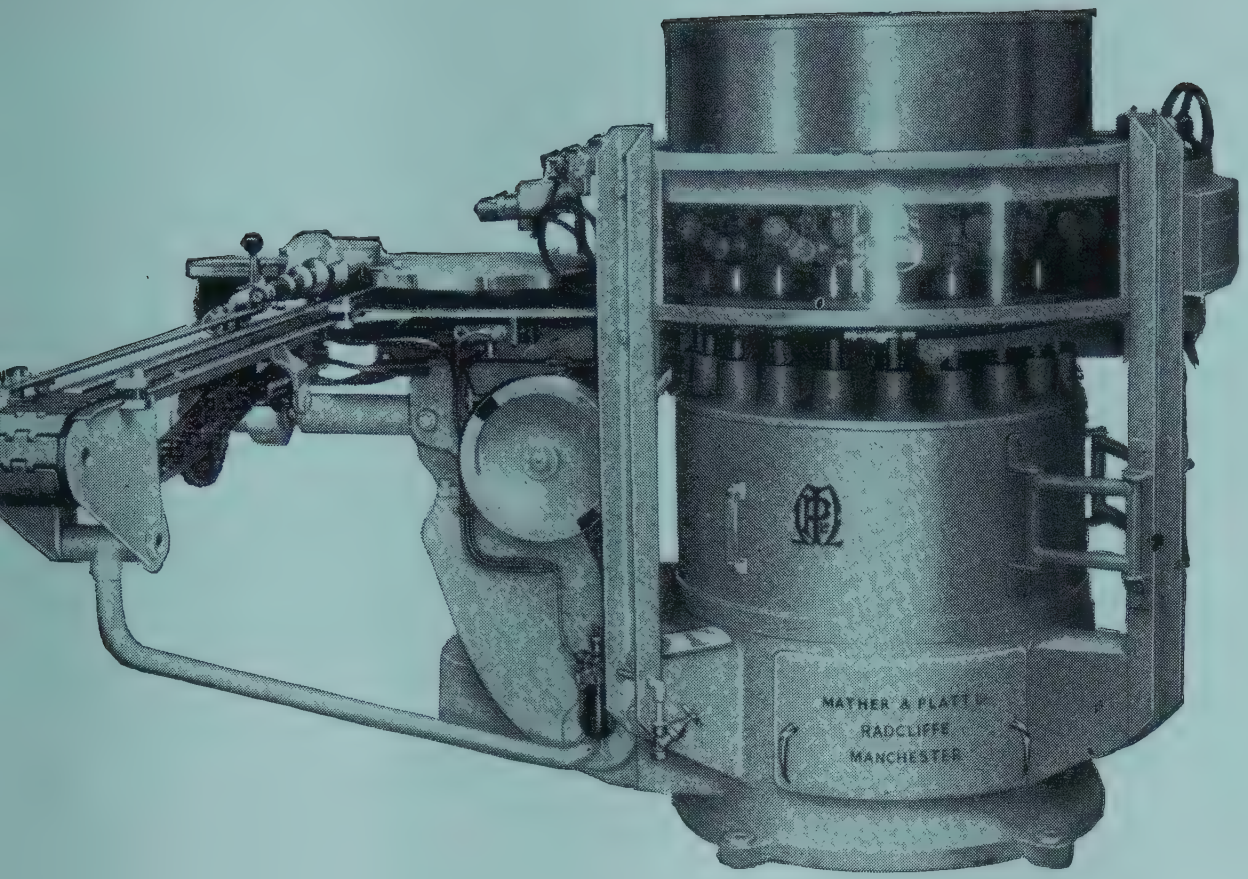
THE conversion of basic stock into good soups for canning is not nearly so simple as it sounds and before embarking upon actual operations the following fundamentals must be understood.

1. After the soup has been made in the kitchen, it has to be filled into the can and sterilized at a high temperature. This high temperature sterilization definitely alters the flavour and texture of the soup and allowance must be made for this when planning the recipe and method of production.

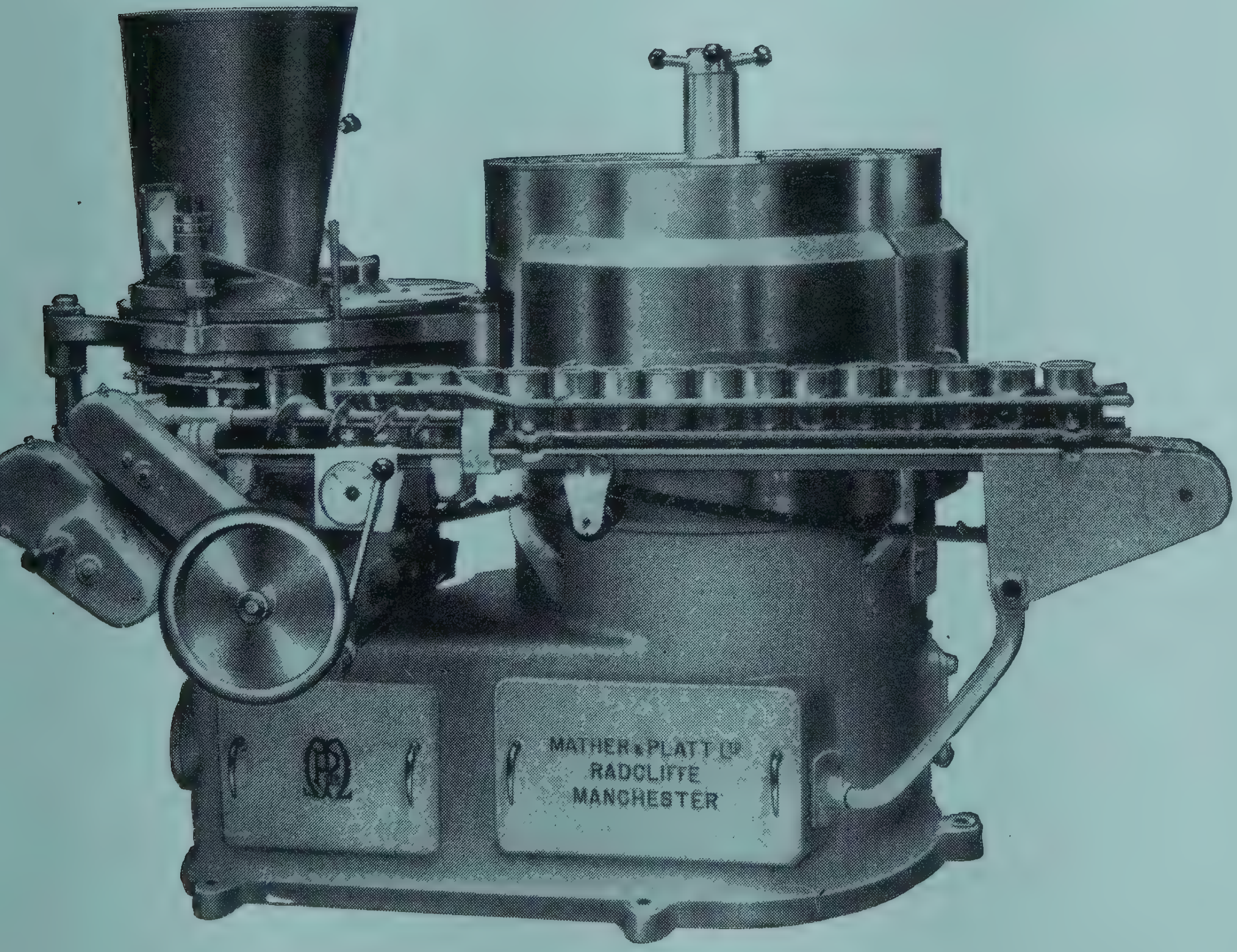
2. Through the years, the public seems to have been educated to, or at any rate to have developed, a liking for a somewhat tastier soup from a can than one normally expects to find in a high-class restaurant. That is to say, the most popular canned soups today are more like very mild sauces than real soups, they are piquant and appetizing rather than fine and delicate.

3. Quite apart from the necessity to make a soup according to public taste and according to the requirements of high temperature sterilization, the time-honoured methods of the kitchen have to be modified again and again to allow of quality control—to achieve a standard "sameness" in each batch. This is a most important aspect of commercial soup making and leads to countless modifications of standard kitchen procedure.

For a start, whatever type of soup is to be made, it is essential to have a standardized stock. This has already been dealt with in the previous chapter, but the user of the stock produced in the last chapter, i.e. the soup kitchen proper, should keep a constant check upon the sameness of the stock supplied. Most certainly a solids content test should be carried out on each main batch of stock made up for use. At the same time, it is most advisable to check the salt content. This can vary a great deal and upset the recipe used for the making

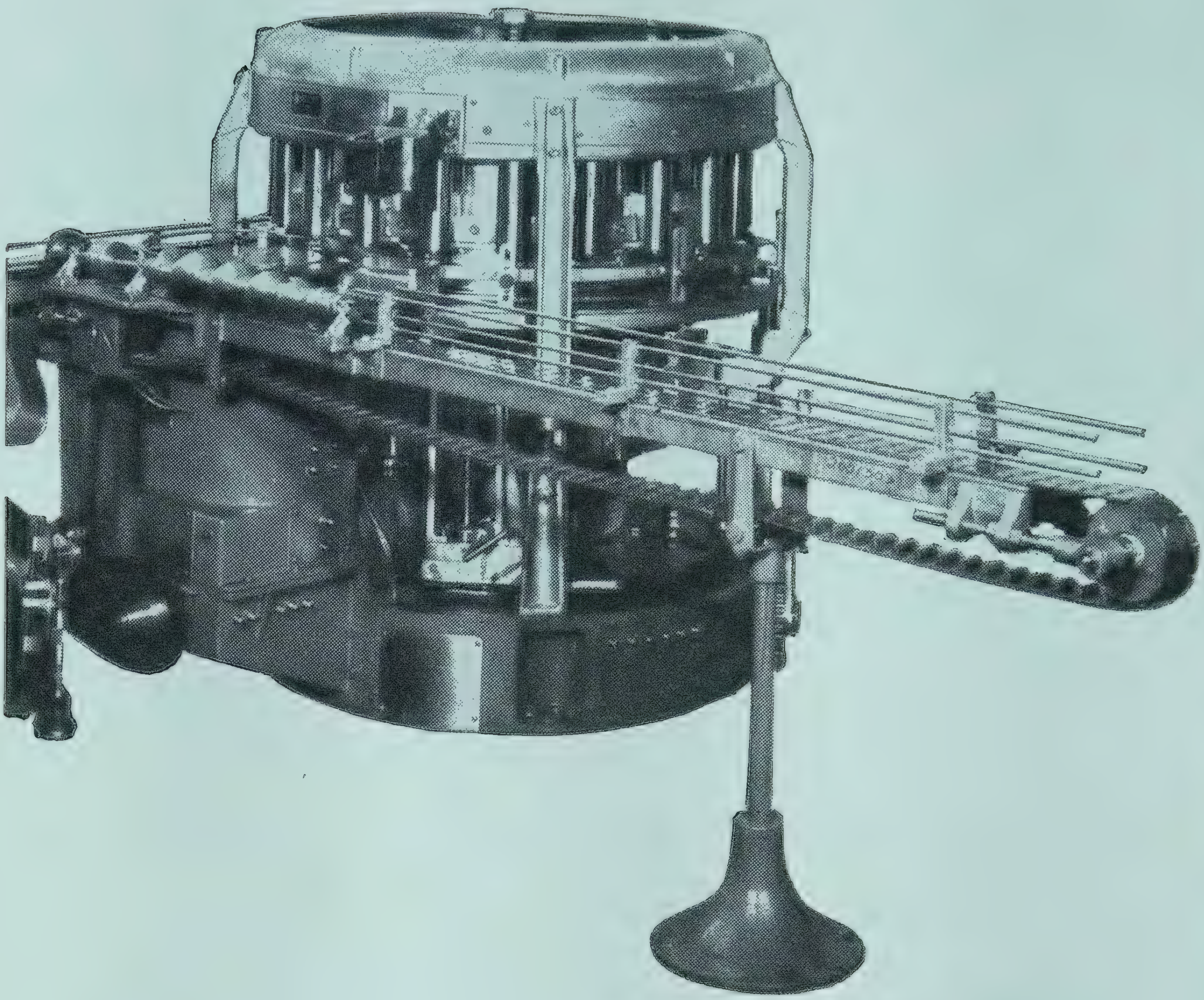

MATHER & PLATT LTD
RADCLIFFE
MANCHESTER

venty cylinder high speed universal filler capable of filling 500 cans of soup per minute.


MATHER & PLATT LTD
RADCLIFFE
MANCHESTER

(By courtesy Mather & Platt Ltd.)

igh speed solid and liquid filler capable of filling 300 cans of soup per minute.



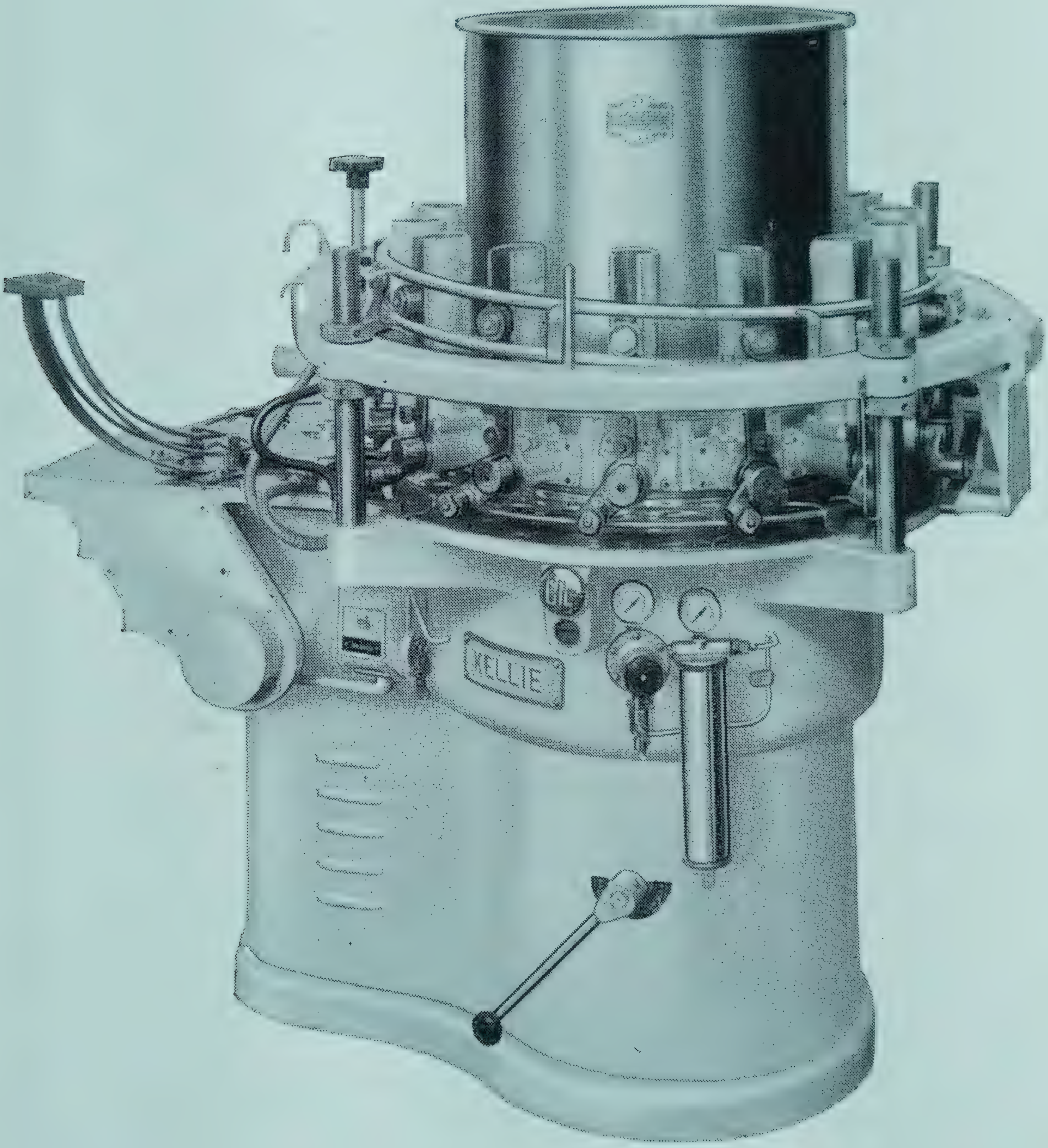
(*By courtesy Varley–FMC Ltd.*)

The F.M.C. 20 pocket M & S can filler for the accurate measurement at high speeds of liquid or heavy semi-solid products such as thick soups.

of the actual soup. Salt contents may be checked very quickly by an electrical device.

There are two main methods used for the conversion of stock into finished soup, irrespective of the type of soup involved. These are the method by which the extra ingredients, e.g. oxtail, are simmered in the stock in very large batches, and the whole lot then finished afterwards, and the method by which the extra ingredients are processed separately and then added to the soup at the last minute before canning. On the whole the former method leads to a better soup, whereas the latter enables closer quality control to be exercised. In either case, the various ingredients to be used must be subjected to various cooking processes to make them suitable for conversion into soup.

It is obviously impossible to deal in detail with the methods which may be applied to making soup from each and every possible recipe, because the method of making on a factory scale will vary with each recipe, and again the use of a different recipe will perhaps require an altogether different arrangement and usage of plant. A selection of possible recipes is given at the end of this chapter, but it is now proposed to deal with some of the salient points which arise in the making of certain different types of soup and more especially the special adaptations which have to be made in order to subject the processes to absolute quality control.



(By courtesy Robert Kellie & Son Ltd.)

This rotary piston filler will fill up to 300 cans of soup per minute. An electro-pneumatic "no-can-no-fill" device is incorporated.

1. *Soup Fillers or Thickeners*

Soup fillers are the most important because upon them depends the thickness of the soup and it is by the thickness or ability to absorb additional water, as well as upon flavour, that the thrifty housewife judges quality.

Perhaps it is wrong to state that the thickness of the soup depends upon the amount of filler, because obviously filler is only a second-class thickener and meat solids, vegetable solids, etc., are the best. However, most commercial soup makers could not afford to use all meat solids so that fillers are essential.

In general, the thickness of a soup should not be judged by its physical appearance of being thick. That is to say, some soups which are quite "runny" looking will stand more dilution than very "porridgy" soups. This is because the best form of thickness in canned soups takes the shape of what are known as soluble solids. That is to say, the solid material is dissolved or dispersed in liquid, like sugar in water. If all the solids are in the form of jelly-like material such as cooked starch, the soup will look and taste thick. Further, the amount of cereal needed to produce such thickness will kill the natural flavours of the meat or vegetable constituents of the soup.

It is generally agreed that a good commercial soup should have about 12 to 16 per cent total solids and of these solids a good proportion should be in the form of soluble solids.

It is reasonable to say that in a soup made from stock, about 2 per cent of the solids will be derived from this stock, with perhaps a further 5 per cent from meat or some other added pulp substance. The rest must be filler of some sort.

Where possible, the filler used should be of a type which gives the maximum actual solids with the minimum actual thickening. Some manufacturers treat their starchy cereal fillers specially to make them suitable for this purpose. This is done by warming a water and cereal mixture gently in the presence of a starch splitting enzyme. By this means, part of the starch in the cereal is converted into sugar and the mix is made thinner, but with very nearly the same total solids. An advantage of this process is that the mix is made sweet and this may contribute quite a lot to the flavour of the soup, especially in times when sugar is expensive. Perhaps it may also be noted at this point that the viscosity of starch thickeners is reduced quite a lot when the mix is made acid and thus the use of vinegar in soup does help to reduce physical thickness.

Quite a range of cereal thickeners may be used for soup, such as ordinary wheat flour, cornflour, arrowroot, oatmeal and so on, but the most common is of course ordinary wheat flour, because it is cheap. Generally speaking, wheat flour is the best filler for brown thick soups, but also there is no doubt that cornflour or arrowroot makes a better cream soup, especially arrowroot. Rice flour and similar products are not widely used in canned soup manufacture.

Where cornflour is used, it is best made up as a smooth paste and then added to the boiling soup, but when wheat flour is used, it may be added in the same manner as cornflour, or it may be browned in fat first and the hot soup added afterwards. Again, either type of filler may be subjected to enzyme conversion before use.

Where wheat flour is to be browned, this may be done in either of two ways. Firstly, the flour may be mixed with fat, rather like shortbread, and then baked very, very slowly in a cool oven in trays. Secondly, it may be mixed with fat and browned in the bottom of the pan to which the hot soup will be added. From a production point of view the oven method has many attractions, as it is easier to manipulate than a small quantity of flour in the bottom of a large pan. In either case, great care has to be taken with the low extraction flours, as these tend to develop off-flavours very easily during browning.

Whatever type of cereal thickener is added to canned soups, the very greatest care must be taken to boil the soup enough really to thicken the flour before canning, and preferably the mix should be emulsified first. If the filler is not properly boiled out, it will tend to thicken as a sort of pudding in the can. That is to say, it will not be properly dispersed in the mix and will make the soup look thicker and rougher in texture than it should.

In the United States, there are a number of specially prepared cereal thickeners for soup and other food products, which give the maximum solids with just the right amount of physical thickening, but no such products are made in this country to the Authors' knowledge.

Besides cereal thickeners, there are a number of other substances which can be used to thicken soups, but most of them are rather too costly. For example, gelatine or gums may be used, as in sauces, and also pectin has its uses, especially in the jelly type of soup. Some of these special soups will be dealt with later. One interesting U.S. Patent 2,142,093, deals with a method of rendering casein suitable as a thickener for soups. The resulting product is free from lactose and disperses easily in soup mixes.

No notes on soup thickeners would be complete without a solemn warning to the user of such products to be very careful about quality control. Cereals especially can vary enormously from lot to lot and where a control laboratory is available, steps should be taken to ensure that purchases are made to given standards. Otherwise it is all too easy to find that one day the soup is totally different because the flour is of quite a different type from the previous delivery.

Use of Soya

It may be said that the two most important qualities in soups to the consumer are body and flavour. In all but clear soups body is a combination of viscosity and thickness. Viscosity alone can be provided by colloidal materials such as starches and gums but these cannot provide thickness. Their effect if they are used in too great a proportion is to give a very viscous soup with a quality of sliminess on the palate very different from the thickness that is not due to viscosity. This desirable thickness can only be achieved with a sufficient proportion of protein and fat dispersed in the aqueous medium made just sufficiently viscous with starch. Because soya consists to the extent of 60 per cent of protein and fat it is an ideal ingredient for providing the desirable thickness which gives good body to the soup.

It is important that soya should be properly processed to be free from objectionable flavour and from residual enzyme activity which might lead to deterioration of the soup during processing or storage. Standards of quality for soya in these respects have been proposed.

In canned cream soups agreed standards of fat content have been established which are more easily achieved if soya is used to contribute a substantial proportion, if not all, of the total fat content. The advantages of soya lie in the fact that its fat content is completely stable and is already in a finely dispersed form. The difficulties of emulsifying added fats and of ensuring that the emulsion remains stable during freezing, canning or storage are thereby avoided. Breakdown of fat emulsions and the consequent appearance of unattractive pools or globules of fat in the soup when served greatly diminish the eye appeal of the product.

The fact that soya presents the fat in a stable form is even more important in the preparation of dry soups. The difficulty of incorporating added fats in such preparations is considerable and their stability towards oxidative or lipolytic rancidity is uncertain. Not only is their surface area greatly increased when they are thoroughly dispersed throughout the non-fatty solids of the formula, so that the risk of oxidation is increased, but they are intimately in contact with the cereal components and the lipolytic enzymes which these contain. The fat of a properly processed full-fat soya on the other hand is well protected by the natural antioxidants of soya and, being included in the soya particles, need never come into contact with the lipolytic enzymes of the cereal components.

Soya, by virtue of its protein and lecithin content, is a powerful emulsifying agent and it is an advantage, if additional fat is required, to mix this thoroughly with soya before combining with the other ingredients. Such added fats will then be well dispersed and protected by the natural antioxidants of soya against the risk of oxidative rancidity.

Where soups are produced for canning or freezing it has been found that soya flour is best incorporated in the roux.

In this case, soya flour can be used principally in two ways. Where a roux is of a high fat content soya flour may be used as a stabilizer, so that the tendency to separate or curdle on preheating is eliminated or minimized. The rate of addition can be in the order of 5–10 per cent of the fat content.

The stability of the roux will probably necessitate a reduction of the amount used for stock, this being controlled by the requirements of the manufacturers.

A typical recipe would be as follows:

Clarified Margarine	40 lb.
Processed Soya Flour ("Trusoy")* .	4 ,,
Flour	68 ,,

The margarine is heated to 240° F. in a steam-jacketed boiler with stirring blades. Soya is blended with the flour and incorporated by stirring for 10 minutes. The stirring is then stopped and the roux cooked for 10 minutes. A further 10 minutes' stirring is then given, the steam turned off and the roux removed from the boiler.

---

* British Soya Products Ltd.

The roux can be made in bulk for chilling and used when required at the rate of 1 lb. per gallon of stock.

The second principle is to use soya flour to reduce the quantity of fat in a rich roux or to supplement the fat content of a lean roux.

In the first instance, soya could replace fat, weight for weight, up to 10 per cent of the fat content of the roux. In the second instance the flour would be adjusted proportionately to maintain the jelling factor of the roux.

The use of soya flour in the roux used for soups of an acid nature, such as tomato, would reduce the precipitation of the proteins, this being a common fault with low-fat soups of this type.

HEINZ
CK TURTLE SOU

Self-heating soups, used extensively by the Services, are now available to the general public by courtesy of H. J. Heinz Co. Ltd.

Special cans embodying a chemical immersion heater using an exothermic chemical are used. The heater comprises a cylinder which runs down from the top of the can into the liquid. The heating chemical itself is contained in this cylinder and of course makes no direct contact with the soup itself. To heat the soup two holes are pierced on each side of the can top, the cap is removed from the top of the heating cylinder, and a light is applied to a small fuse. The fuse can be ignited by a burning cigarette end. In five minutes the food is heated and ready to eat.

Soya flour is also used extensively in pre-mixed powdered soups and ranges from 10 to 25 per cent of the total mixture according to the degree of richness required and the type of soup being made. Again soya would be used as the fat factor and would be adjusted to suit the manufacturer's requirements, taking into consideration the protein content with the added soya.

A full fat soya flour such as "Soyolk" can be satisfactorily incorporated in soup manufacture, especially in connection with cream soups.

The analysis of "Soyolk"* is as follows:

Moisture	7·0 per cent	
Protein (N × 6·25)	40·0 ,, ,,	
Fat	18·0 ,, ,,	
Phosphatides	2·0 ,, ,,	(as Lecithin)
Ash	4·6 ,, ,,	
Fibre	1·81 ,, ,,	
Calcium	0·2 ,, ,,	
Phosphorus	0·6 ,, ,,	
Sugars	8·0 ,, ,,	
Other Carbohydrates	18·0 ,, ,,	(no Starch)
Overtails on 100 mesh sieve	1–2 ,, ,,	

Calorific value per 100 grams = 413
Calorific value per lb. = 1,870

The analysis shows clearly that soya flour is constituted to act as an emulsifier and stabilizer in a wide range of foods. The phosphatide fraction (known commercially as lecithin) acts as an emulsifying agent in the formation of both oil-in-water (e.g. salad cream) and water-in-oil (e.g. margarine) emulsions. The large amount of protein serves to stabilize the emulsion. In this manner, soya flour has a beneficial effect on the texture of cream soups in which a smooth, stable creamy emulsion is required.

In connection with dry mixes, the inclusion of "Soyolk" at between 10 and 15 per cent is suitable. The reasons are exactly the same as for canned soups. In addition, "Soyolk", being a natural antioxidant, has a very long shelf-life, and would certainly keep fresh longer than most other ingredients included in a prepared dry mix.

* Soya Foods Ltd.

2. *Soup flavours*

The question of the actual flavours to use in any given soup is largely a matter of opinion, between one manufacturer and another, and the blends so varied that it is almost impossible to deal with all the possibilities. It is therefore proposed to deal with general principles here.

Probably the first and most important question which any would-be soup manufacturer will ask is: Shall I use real spices or shall I use the standardized liquid and powdered spices? This is a very difficult question to answer, because whilst there is little doubt that the best flavours are obtained by the use of whole spices and herbs, these are very, very difficult to standardize and control. One may hang a bag of this or that in the stock or in the soup and one may use the same amount each time, but so much depends upon the age and quality of the spices that the results can vary enormously. On the other hand, liquid and powdered spices can be measured and used to a fine degree of accuracy each time.

Probably the answer to this question is that for most commercial purposes it is easier to use the standardized products, but that if the factory is very large and can afford to buy spices in big quantities and employ an expert to handle them, then whole spices are best. There are, however, certain techniques which may be employed by the smaller manufacturer which may enable him to make more standardized products with whole spices than is possible by other means, which are described below.

In general, it is not enough just to hang a bag of spices or herbs in the stock-pot or soup-making pot, or to add liquid spices to the brew for canning. This method is all very well for the household or restaurant soup and it will of course produce quite a good article for canning, but it must be remembered that the household soup usually has more high-class contents, such as meat, than a commercial soup maker can afford, and it does not therefore need either such a lot or as careful spicing as the cheaper commercial mix. Further, it must be remembered that the public taste for a commercial canned soup is for something tasty. If sufficient whole spices or oils are added to a commercial soup to give it that excitement which is called for, then there is a danger that it will taste like Christmas pudding! If these extra spices and other flavours are to be added, then some means must be found of blending the flavours more deeply into the mix and of producing a matured flavour. Indeed, it may be noted in passing that very few manufacturers seem to realize the staggering difference between a product which is just mixed up and one containing the same ingredients but precisely blended in such a manner that the flavours produced are "rounder".

At this stage, it may perhaps be noted that both sugar and wine are more than useful in producing that smooth, natural effect in spiced or flavoured foods. Where it can be afforded, there is no doubt that a little wine added to the recipe will work wonders, but a very little sugar or, as has been mentioned, sweetened cereal, will go a long way. Many famous chefs have stated in their cookery books that they always add a very little sugar to all dishes, "last of all", to round off and mature the flavour. However, in commercial soup making, it is through the use of vinegar or sauce that the best maturing effects can be obtained.

In almost all soups a little vinegar is required and the skilful manufacturer can use this vinegar content to "carry" the spices and flavours. That is to say, apart from just ordinary malt vinegar, there are a host of special vinegars which can be bought or made up for soup making. There are for example the various spirit vinegars, there is cyder vinegar—a most useful ingredient in soup—and there are the flavoured vinegars such as tarragon vinegar. In addition to these, the soup manufacturer can make up his own special brews for adding to soups, and once made these brews can be casked and left to mature for as long as they will keep. Thus, for example, all the spices and even some of the other flavouring ingredients to be used in a given soup, may be added to vinegar and put away until the full flavours are drawn from the spices and the whole effect blended together to form a really savoury and mature flavouring agent for the soup. Apart from cyder vinegar, many pleasing vinegars can be made from fruits, such as pineapple, raspberry and even tropical fruits such as guava.

Along with the straight or spiced vinegars in soup making, go the slightly more complicated vinegar products, which are really sauces, such as Worcester sauce, beefsteak sauce and so on. All these are useful in soup making.

Besides straight spices and herbs, etc., there are a number of important flavouring ingredients for soup, especially where a tasty commercial product is required.

First of all, there is the group of materials of the protein derivative type, including such items as yeast extract, hydrolysed protein, and of course monosodium glutamate (M.S.G.). The yeast extract type of flavouring is much cheaper than M.S.G. but is used in larger quantities to produce a definite piquant meaty flavour, whereas M.S.G. is comparatively expensive and is used in very small quantities of the order of 0·5 per cent to pep up existing flavours. M.S.G. is a very useful product, as it improves many products out of all recognition, even when only a trace is added. In other products, e.g., tomato soup, it prevents the formation of that slightly metallic flavour often noticed. In passing, it is perhaps worth noting that the paste type of meat or vegetable extract is often very difficult to get out of the can and this may be overcome by having a steam-heated cabinet in which there is a container with a tap and with a wire grid on top. The opened cans of extract may then be inverted on the grid and the contents allowed to drip slowly into the container as heat is applied.

Whilst not properly a flavouring ingredient, but rather a bulk ingredient in soup, tomato purée plays a very important part in almost all commercial soup flavouring. It is difficult to describe just what it is that tomato gives to the soup, but undoubtedly a little tomato in almost any recipe adds "life" to the flavour not provided by anything else.

Again, whilst not properly a flavouring ingredient, it is surprising what effect upon flavour the use of extruded dough products of the right type may have upon certain soups. In soups in which vegetables and extruded dough products are used as garnish also, the use of cheese or cheese oil has been found to be advantageous.

In view of the great importance of proper control over the amount of each type of flavouring ingredient which is added to each batch of soup, as it is made, it is good practice to have a small room set aside apart from the rest of the soup kitchen, in which the spices, flavours and colours, if any, are weighed up. If such a room is conveniently arranged, all the necessary flavour or colour ingredients for one batch may be weighed out and placed into standard-sized containers assembled on one tray. These trays are then issued to the chef in charge and the entire contents of that one tray put into one batch. This system reduces risk of double lots being added to the soup or of one or another ingredient being missed. Further, as spices and flavours are very costly, it is important to keep these ingredients where they will be carefully handled, away from the rest of the factory production line.

SOUP IMPROVERS

A range of soup improvers for incorporation in soup made commercially has been developed by W. J. Bush & Co. Ltd., which is available with suggested usage per ten gallons of soup:

		Per 10 *gallons Soup*
Soup Flavour Improver C.3600	for Tomato Soups	¼ fl. oz.
Soup Flavour Improver C.4982		¾–1 ,, ,,
Soup Flavour Improver C.5298		¼ ,, ,,
Soup Flavour Improver C.6472	for Julienne Soups	¼ ,, ,,
Soup Flavour Improver C.7080	for Pea Soups	¾ ,, ,,
Soup Flavour Improver C. 7081	for Mulligatawny Soups	⅓ ,, ,,
Soup Flavour Improver C.7082	for Mock Turtle Soups	⅜ ,, ,,
Soup Flavour Improver C.7083	for Celery Soups	⅓ ,, ,,
		Per 100 *lb. base*
Soup Flavour Improver H.5685	for Chicken Soups	10 oz.
Soup Flavour Improver Powder H.7391	for Chicken Soups	3 lb.

The following range of Emulsion Flavours is also available in the W. J. Bush "Flavor-Mist" series of Improvers for Soups.

	Per 100 *gallons Soup*
"Flavor-Mist" Celery Soup Improver	3½ fl. oz.
"Flavor-Mist" Kidney Soup Improver	3 ,, ,,
"Flavor-Mist" Meat Extract Improver	4–5 ,, ,,
"Flavor-Mist" Mixed Vegetable Soup Improver	3½–4 ,, ,,
"Flavor-Mist" Mock Turtle Soup Improver	4½ ,, ,,
"Flavor-Mist" Oxtail Soup Improver	4–5 ,, ,,
"Flavor-Mist" Pea Soup Improver	8 ,, ,,
"Flavor-Mist" Tomato Soup Improver	2½ ,, ,,

3. *Thick Meat Soups*

Probably the most important canned soup in this category is oxtail soup. In this case, the most important point is to get the maximum flavour out of the oxtails. As has been stated, the oxtails must be cut up into small pieces before use. In most cases, the small sections at the end of the tail are saved to garnish the cans, whilst the larger sections are used to make the actual soup. If the sections of tail are first given a light roast in the oven and then subjected to a steam pressure cooking in the retort, it will be found that the meat develops a full flavour and a considerable quantity of golden oil is released. The next stage must of course be to get all the meat possible off the bones and into the soup, together with the maximum flavour. This may be done in either of two ways. In the first method, a measured quantity of cooked oxtail is put into the steam pan along with vegetables and stock and the whole lot cooked for several hours. At the end of this time the entire batch is run through the pulper to finish it off and to remove the meat from the bones. This method is very good and results in a good soup, however there is absolutely no way of telling just what quantity of oil and meat will result from a given weight of tails and thus the soup may be thicker at one time than another. It is indeed surprising by just how much such soup can vary. The second method of operation is to cook the tails sufficiently in the retort stage to allow of the easy removal of the meat in the pulping machine or colloid mill. Thus all tails are put through the machine together with a quantity of stock to wash out the machine. The resulting pulp is then measured out into standard quantities and added to the batches of soup in the finishing kettles. The same applies to the golden oil.

When the smaller pieces of tail are used to garnish the cans, great care must be taken to see that no extra large pieces are allowed to be used, as if the retorting time is exactly calculated for small pieces of tail, one or two cans with large pieces in them may be incompletely sterilized.

Some manufacturers make a straightforward meat soup, or of course try to use the meat solids of the meat they have used for making up the stock. This is always rather a problem as meat varies enormously in texture and sometimes the yield from the pulper is very poor and hardly ever is it possible to get all the meat through in the form of pulp suitable to put into the soup. One method of getting over this, is to stew the meat up with B.P. standard hydrochloric acid and then to neutralize the whole brew with sodium hydroxide. The result is of course to produce very tender meat and a certain amount of salty water from the neutralization processes. This process is the subject of several patents, and in any case should not be undertaken unless stringent laboratory control is available. As an alternative to the acid hydrolysis method, there are certain enzymes which can be used to soften meats, but care has to be taken to avoid the formation of off-flavours.

In the handling of all meats for meat soups, great care has to be exercised to avoid either cooking the meats too much, or more especially, keeping them lying about in the cooked state too long. This is partly because the bacterial count can go up very quickly, but also because meats which are either overcooked or held too long seem to develop a peculiar gluey, almost dirty taste when sterilized in the final soup product in the can.

Mulligatawny is quite a popular thick soup and in its original form was a very highly spiced thick soup, of which the essential spice character was curry powder. The actual name "mulligatawny" is derived from two native words meaning "pepper-water". This soup, in a slightly milder form can be most attractive and a very good starting base is rabbit, as this flesh seems to blend very well with curry powder. It is most important to use a really good curry powder, as otherwise it is very easy to produce a musty flavour. This soup can be very much improved by the incorporation of mango chutney of the sweet type and also coconut meat and rice. The coconut meat, and milk if it is available, makes a great deal of difference as it smooths off the taste of the curry. When rice is used as a garnish in the can, for this or any other soup, it cannot be put into the can raw, but must be cooked first, as otherwise it merely sticks together in a lump in the bottom of the can. The best way to treat rice in order to make it float through the soup evenly when it is served, is to roast it first in trays in the oven. In this method, the rice grains are first coated with hot fat or oil and then given a gentle roast in the oven. Not enough to make the mix brown, but enough to start to soften the rice and to drive the fat or oil into the grain. The trays are then topped up with hot water or stock and the rice cooked until it is firm and free running. It is then placed into the cans, preferably whilst still hot.

Thick mock turtle soup is usually made from calves' heads and should have at least some bacon in it. One of the most important flavouring ingredients is lemon. Some manufacturers have found it an advantage to use sieved lemon marmalade, as this is a standard product available at all times and at the same time the peel is then used and imparts a rather pleasant bitter element.

4. *Vegetable Soups*

There are of course both thick purée type vegetable soups, the most important of which is tomato (notwithstanding the fact that the tomato is a fruit), and also the diced vegetable type of soup, which often has a meat base.

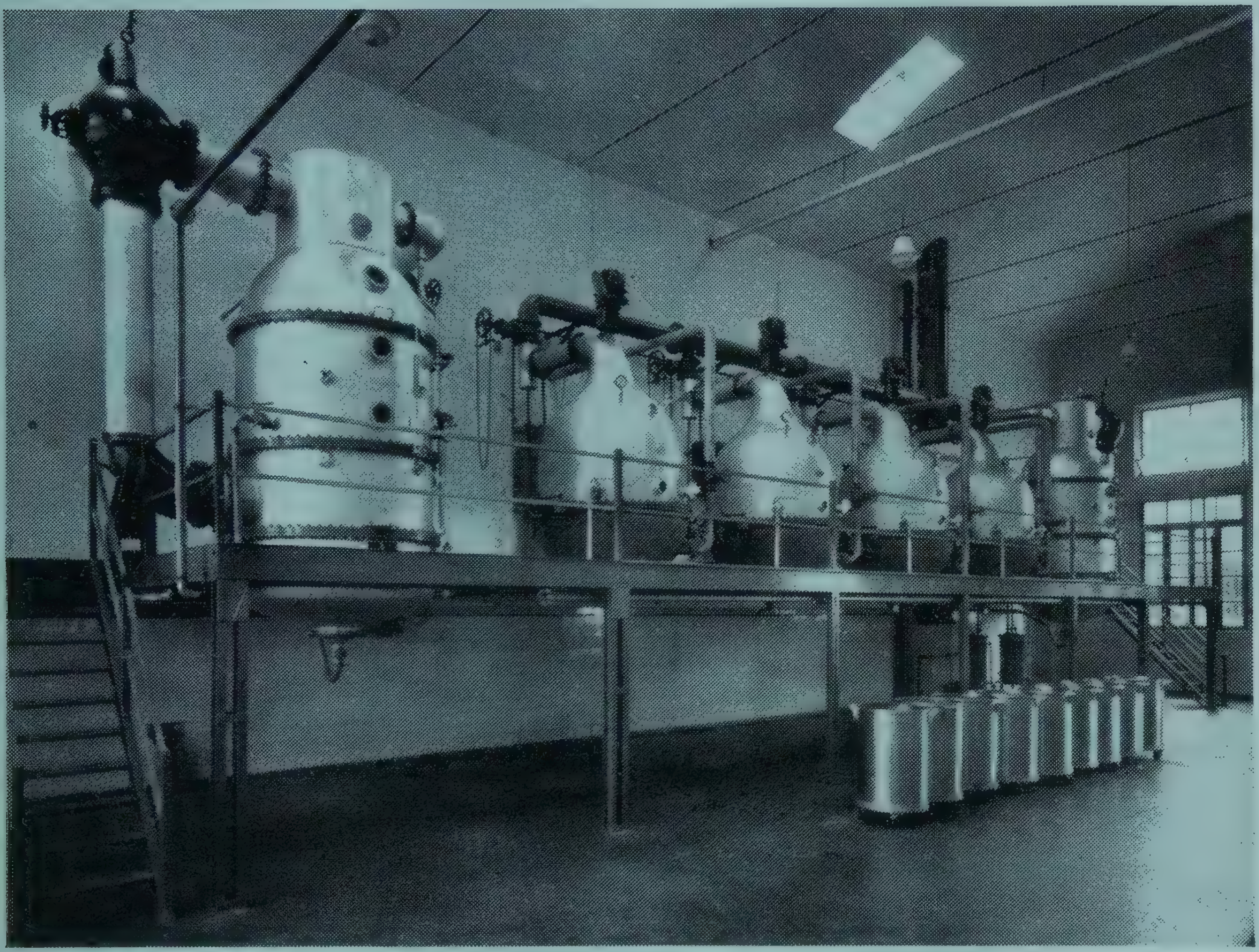
There is no doubt at all that in the soups where the main flavour is that of vegetables, the real secret lies in using really fresh vegetables which have been freshly prepared. Whilst the purchase of fresh vegetables does not present an enormous problem to the manufacturer, at any rate in the autumn of the year, the actual production of cleaned and diced vegetables in big quantities is quite a problem. In many cases, it is found most convenient to prepare diced vegetables well in advance of actual soup making, often in fact the day before. These vegetables are usually then stored in half-barrels in water. There is no doubt, however, that this is quite wrong if a quality product is required, as stored vegetables definitely develop a strong flavour. Wherever possible then, the vegetables should be cleaned and prepared at a rate equalling that of consumption in the soup kitchen, even if this does raise some management problems.

Diced vegetables for garnishing the cans may be greatly improved by pre-browning in hot fat, but in any case they should be pre-blanched and cooled in cold water. They should never be added to the can raw.

Soups of the diced vegetable type really need other ingredients as well as the diced vegetables themselves and as has already been pointed out in another section of this book, extruded dough products, rice, and such items as cheese oil make a world of difference to the flavour.

Pea soup is particularly popular and this may be made from either fresh peas or dried peas. Where fresh peas are used, the pods may be utilized to make stock with good results, and mint oil should be used for flavouring. Pea soup in particular should be well emulsified before canning as it tends to go "grainy" very easily.

Tomato soup is really a subject all on its own, as it is probably the most popular soup of all and one of the most difficult to make, especially the creamed variety. In this country, nearly all tomato soup is made from pre-canned imported tomato purée, which can of course be bought in various degrees of concentration. In this respect, it may be said that the best soups result from purée of higher concentration, although this purée is usually relatively dearer.



Battery of stainless steel concentrators for the production of tomato purée.

There are of course innumerable recipes for making tomato soup, but there are three points of special interest. Firstly, arrowroot has been found to be the best thickener for this type of soup. Secondly, this soup should be emulsified and if it is to be sieved to give it a final gloss this should be done over a vibrating screen rather than through a pulper. Thirdly, if milk is to be added this should be done last. In this case, the milk should be heated to at least 200° F. before it is added to the soup, or it will curdle. Where a laboratory is available, a constant check should be kept upon the acidity of the milk purchased to obviate souring and curdling troubles even during the initial heating-up period

A final note on the problem of curdling in creamed soups is of interest. The following points should be observed in this connection:

1. The starch or flour ingredient should be pre-gelatinized beforehand. With wheat flour, this should be cooked for 2½ minutes at 210° F.
2. Fat should be homogenized before this is mixed with the pre-cooked starch. If the pre-cooked starch fraction is homogenized breakdown is experienced.
3. Salt tends to accelerate curdling and clotting in cream soups but this effect is minimized in the presence of emulsified fat.
4. When the pH is reduced to 5·0 or lower heavy clotting is experienced but this does not happen with cream of tomato soups where the pH is usually 4·6 or so.
5. Time and temperature of retorting, sieving, sugar and milk condition do not appear to affect curdling.

A few facts about consumption of canned and dried soups are of interest. It was stated recently that during 1957 purchases of canned and of dehydrated soups increased; as usual there was a tendency for purchases of the latter to be confined to the more expensive brands during the summer months. There also appears to be no steady increase in consumption of canned soups as children grow older, this no doubt being due to the increasing cost of feeding a growing family.

Some interesting facts about British eating habits were compiled by a marketing firm for the year 1955–6 and published as "The Foods We Eat" in 1958. It was disclosed that in the country as a whole 6 per cent of men and women have soup at the midday meal in summer whereas this rises to 18 per cent for men and 19 per cent for women in winter. For Scotland the comparable figures are, men 30 per cent and women 3 per cent in summer, and men 48 per cent and women 56 per cent in winter.

Again, in the whole country, 3 per cent of men and women ke soup at the principal evening meal in summer whereas e figures are 8 per cent for men and 7 per cent for women in inter. For Scotland the figures are: *Summer*, men 9 per cent and omen 7 per cent; *Winter*, men 23 per cent and women 16 per ent. The London figures are only a very small proportion of e Scottish ones, as may be imagined.

The annual consumption of canned soups in the United ingdom has been calculated at about 150,000 tons per annum r 1958 and 161,396 tons for 1959, and, no doubt, these figures re increasing.

The following list of known commercially canned and ottled soups shows the wide range already available:

sparagus
sparagus, Creamed
ean with Bacon
eef Broth
eef Noodle
ird's Nest
rown Windsor
elery
elery, Creamed
hicken
hicken Broth
hicken, Creamed
hicken Gumbo
hicken Mulligatawny
hicken Noodle
hicken with Rice
onsommé
reen Pea
reen Pea, Creamed
ulienne
angaroo Tail
idney
entil
obster
eat
Minestrone
Mock Turtle
Mulligatawny
Mushroom
Mushroom, Creamed
Mussel
Onion
Onion, Creamed
Oxtail
Oyster
Royal Game
Scotch Broth
Soups for Babies
Spinach
Spinach, Creamed
Tomato
Tomato, American Style
Tomato, Creamed
Tomato with Rice
Turkey
Turtle
Vegetable
Wild Duck
Vichyssoise, Creamed

The following soups are canned commercially in the United States in addition to most of those listed already:

Almond, Creamed
Avocado, Creamed
Bean
Bean, Black
Bean, Lima
Bean with Ham
Beef
Beef Bouillon
Beef Consommé, Jellied
Chicken Consommé, Jellied
Chicken, Country Style
Clam Broth
Clam Chowder, New England Style
Clam Chowder, New York Style
Clam Consommé
Consommé, Madriléne
Consommé, Printanier
Corn Chowder
Corn, Creamed
Crab Bisque
Cucumber, Creamed
Fish Chowder
Gumbo Creole
Mutton Broth
Noodle
Okra
Onion, French Style
Oyster, Creamed
Pepper Pot
Purée Mongole
Quahaug Chowder
Shrimp, Creamed
Soup Stock
Tomato, Bretonne Bean
Tomato Bisque
Tomato Okra
Turtle and Fresh Pea
Vegetable, Beef
Vegetable, Creamed
Vegetable, Vegetarian
Vermicelli
Watercress, Creamed

STANDARD FOR TOMATO PURÉES

Approved and adopted by the C.I.P.C. Sub-Committee for the regulation and definition of canned tomato products at the meeting in Brussels in October 1958

Article I—Definition

1. The terms "tomato purée" and "tomato paste", accompanied by the words "light", "medium" or "heavy" in accordance with the degrees of concentration as hereafter defined, apply to the canned products prepared by straining the fresh fruit of the tomato *Lycopersicum esculentum* L., and concentrating, thereby removing part of the water, the resulting pulpy liquid.

2. According to the degree of concentration, estimated by

the determination of the refractometer solids (less added salt) as set out in Article IV, the products listed in paragraph 1 above are described as follows:

Minimum percentage of refractometer solids (less added salt)	*Description*
11	Light tomato purée, minimum solids 11 per cent
15	Medium tomato purée, minimum solids 15 per cent
22	Heavy tomato purée, minimum solids 22 per cent
28	Light tomato paste, minimum solids 28 per cent
36	Medium tomato paste, minimum solids 36 per cent
45	Heavy tomato paste, minimum solids 45 per cent

The minimum percentage of solids, corresponding to the degree of concentration in accordance with the list given above, shall be stated on the label, immediately following the name of the product and given as a single number written in the same type, as follows: "minimum solids: × %".[1]

The sale of tomato purées containing less than 11 per cent solids is not permitted. This prohibition does not however apply to tomato juice, nor to tomato soups, sauces, seasonings or pickles.

The percentage of solids shall always be given less added salt, that is to say minus the quantity of salt which has been added to the product, corrected for the natural chlorides present in the tomato, which are arbitrarily rated as amounting to 2 per cent of the solids.[2]

3. The tomato purées and pastes defined above may be sold either without any statement of quality (standard quality) or with the statement "extra quality". They should satisfy the requirements set forth in Article III.

No other description is permitted.

ARTICLE II—GENERAL CHARACTERISTICS

A—*Raw Materials*

1. Tomatoes intended for the preparation of the products described above shall be fresh, sound and in good condition, free from rot and generally free from mould, and shall have reached a suitable degree of ripeness.

2. They shall have been graded, washed, and if necessary trimmed.

3. Trimmings shall not be used in the preparation of food for human consumption.

B—*Finished Product*

1. The tomato purées as described above shall have been freed from seeds and skin. They must also satisfy the conditions stated in Article II herein.

2. White cooking salt (sodium chloride) may be added provided that this addition be declared conspicuously on the label by the words "salt added", and provided that the amount added does not exceed 2 per cent in the finished product for purées of 11, 15 and 22 per cent minimum solids, 3 per cent for purées of 28 and 36 per cent minimum solids and 5 per cent for purées of 45 per cent minimum solids.

The addition of herbs and natural spices or their extracts to tomato purées is permitted provided that such addition be stated on the label by the word "flavoured" or "spiced", or both, as the case may be.

The addition of sugars (sucrose, dextrose, dextrose syrup, invert sugar and the like) to tomato purées and tomato pastes covered by the present specification is not permitted. It shall however be allowed in products shipped to processors and provided it has been expressly asked for by the buyer or his agent; in this case the statements "sugar (sucrose, dextrose, etc.) added × %" and "product not intended for direct consumption" shall appear on the label. These statements shall be given in type of the same appearance and not smaller than half the size of the type used for the description prescribed under Article I, paragraph 2 above.

3. It is forbidden to add to products sold commercially under the descriptions given in Article I, paragraph 2 above, or under a description capable of being confused with the former, ingredients other than those described in Article II, B, paragraph 2, especially cereals or thickening agents (e.g., flour, cornflour, starch, dextrin, pectins, alginates) and purées of other vegetables (e.g., carrots, beetroots, apples, pumpkin, paprika).

Tomato products other than those defined above or which will be defined in other special standards, to which addition of one or more of the ingredients covered by this paragraph is permitted, must be described by a name which cannot give rise to any confusion between them and the preparations covered by these standards, and their qualitative composition must be shown on the labels.

4. Tomato purées covered by the present standards should not contain artificial colours, preservatives or artificial sweetening agents.

5. The cans shall be filled as much as practicable without impairment of the appearance, the quality or the good preservation of the product.

ARTICLE III—QUALITY GRADES

A—*Physical Properties*

	Standard quality	*Extra quality*
Colour	Red colour characteristic of ripe tomatoes.	Equivalent or better, in the sense of an increase in the ratio of red to yellow, to that of the following combination of Munsell colours:[3] Red 5R 2,6/13 brilliant 65 per cent Orange 2,5 YR 5/12 brilliant 8 per cent Black N.1 brilliant, Grey N.4 dull 27 per cent
Texture and consistency	Reasonably homogeneous.	Homogeneous.
Impurities	The presence is allowed of natural vegetable impurities visible only on a careful examination by the naked eye.	Examination by the naked eye should not reveal any impurity.
	Microscopic examination according to the Howard method should not show the presence of mould in more than 60 per cent of the fields.	Microscopic examination according to the Howard method should not show the presence of mould in more than 40 per cent of the fields.
Flavour and smell	Absence of foreign and abnormal tastes and odours.	Absence of foreign and abnormal tastes and colours.

B—*Chemical Properties*

	Standard quality	*Extra quality*
Minimum content of total reducing sugars, expressed as invert sugar p.100 of solids less added salt	45	50
Maximum titratable acidity, expressed as hydrated citric acid p.100 of solids less added salt	10	9
Maximum volatile acidity, expressed as acetic acid p.100 of solids less added salt	0·50	0·25
Maximum water insoluble inorganic impurities p.100 of solids less added salt	0·1	0·05
Maximum copper content p.100 of solids less added salt	0·01	0·01

ARTICLE IV—METHODS OF EXAMINATION

The sampling and the estimation of the different characteristics described in the present standards shall be carried out by methods approved by the C.I.P.C.

It is specified that the percentage of solids is estimated by the refractometric reading at 20° C., according to the method described in the appended note.

Filling of Cans

Solids		11 *per cent*	15 *per cent*	22 *per cent*	28 *per cent*
Dimensions[4] *of cans* mm.	*Capacity of cans* ml.	*Minimum net weight in grams*			
55 × 68	142	140	140	145	150
100 × 118·5	850	850	860	890	910
153 × 181	3100	3100	3150	3250	3300
153 × 246	4250	4250	4300	4450	4550

APPENDIX I

Filling of Cans

The minimum weight of product to be packed in the can corresponds to the figures given hereafter for certain sizes of cans; for can sizes other than those listed, it shall be calculated in proportion to the volume of the can.

APPENDIX II

Determination of the Refractometer Solids in Tomato Purées

Details are given in an appendix published in the official schedule of the apparatus suitable for such determinations and the method employed.

APPENDIX III

Estimation of Chlorides

Describes the method and the reagents necessary.

---

[1] This provision concerning labelling does not apply to tomato purées and pastes sold to processors.

[2] The figure represents the approximate average natural chloride content of tomatoes; but under certain circumstances the natural chloride content of tomatoes may reach and even exceed 4 per cent of the solids.

[3] These figures apply essentially to light tomato paste with 28 per cent minimum solids.

[4] Inside diameter and overall height.

Commercial Soup Formulae

CANNED OXTAIL SOUP

Oxtail Meat	24	lb.
Onions	18	,,
Carrots	18	,,
Wheat Flour	17	,,
Salt	3½	,,
Yeatex	2	,,
M.S.G.	1½	,,
Hydrolysed Protein	1½	,,
Caramel	½	oz.
Paprika	½	,,
Ground White Pepper	½	,,
Bay Leaves (Whole)	⅓	,,
Ground Thyme	⅙	,,
Ground Coriander	⅙	,,

Bulk to 30 gallons with stock.

Prepare bone stock by boiling beef bones at the rate of 40 lb. per 10 gallons of water. Skim off all fat and strain before use. Bones from the oxtail can be used additionally, if desired. Prepare and chop the vegetables and retort in stock with the bay leaves for 30 minutes at 240°F. Remove the bay leaves and pass the vegetables through a sieve to form a purée. Make a paste with the rest of the ingredients (except oxtail meat) and stock and add to the purée. Bulk to 30 gallons with stock, bring to the boil and simmer for 10 minutes. Place 1½ oz. of oxtail meat (chopped) into each No. 1 Tall plain can and fill with hot soup. Seal, process for 1¼ hours at 240° F. and water cool.

CANNED CREAM OF GREEN PEA SOUP

Green Peas, Fresh or Frozen	85	lb.
Milk	6½	gals.
Wheat Flour	13½	lb.
Butter	5¼	,,
Salt	2¼	,,
Protex No. 8	1¼	,,
Sugar	¾	,,
Onion Powder	¾	,,
M.S.G.	7	oz.
Ground White Pepper	½	,,
Ground Bay	¼	,,

Bulk to 30 gallons with stock.

Prepare stock by processing in a retort bacon bones and bacon pieces with water. Strain off the liquid and skim off fat, if necessary. Purée the cooked green peas and add the other ingredients. Bulk to 30 gallons with stock, bring to the boil and then fill hot into plain No. 1 Tall cans. Seal, process for 1¼ hours at 240° F., then water cool.

CANNED CREAM OF ASPARAGUS SOUP

Milk	12	gals.
Asparagus, Fresh, Frozen or Canned	69	lb.
Butter	15	,,
Wheat Flour	11	,,
Salt	3	,,
M.S.G.	10	oz.
Hydrolysed Protein	10	,,
Ground White Pepper	1	,,
Ground Bay Leaf	½	,,

Bulk to 30 gallons with water.

Macerate the asparagus and add to the other ingredients which have been previously mixed to a smooth consistency in a steam-heated jacketed stainless steel pan, fitted with a stirrer. Bulk to 30 gallons with water, bring to the boil, simmer for 5 minutes and then fill hot into No. 1 Tall plain cans. Seal, process at 240° F. for 1¼ hours, then water cool.

When canned asparagus is used, the liquor is added to the soup when making up to volume. Asparagus tips may be added as a garnish.

CANNED SCOTCH BROTH NO. 1

Carrots	30	lb.
Mutton	25	,,
Peas (dried, soaked)	20	,,
Onions	13	,,
Flour	9	,,
Barley	8	,,
Potatoes	6½	,,
Swedes	6½	,,
Salt	4	,,
M.S.G.	12	oz.
Protex C.S.C.	8	,,
Ground Celery Seed	2	,,
Ground White Pepper	2	,,
Dried Parsley	½	,,

Bulk to 30 gallons with stock.

Prepare and dice the mutton and vegetables and boil the mutton bones in water for about one hour. Mix the ingredients well and bulk to 30 gallons with the strained mutton stock. Bring to the boil, simmer for a few minutes and fill into No. 1 Tall plain cans. Seal and process for 75 minutes at 240° F., then water cool. This soup is of thick consistency and can be diluted with water or milk before use.

CANNED SCOTCH BROTH NO. 2

Carrots	30	lb.
Mutton	25	,,
Dried Peas (soaked)	20	,,
Barley	16	,,
Onions	13	,,
Wheat Flour	4½	,,
Salt	4	,,
M.S.G.	12	oz.
Protex No. 8	4½	,,
Ground Celery Seed	2	,,
Ground White Pepper	2	,,
Dried Parsley	½	,,

Bulk to 40 gallons with stock.

Prepare and dice the mutton and vegetables and boil the mutton bones in water for about one hour. Mix the ingredients well and bulk to 40 gallons with the strained mutton stock. Bring to the boil, simmer for a few minutes and fill into No. 1 Tall plain cans. Seal and process for 75 minutes at 240° F., then water cool.

CANNED DUTCH PEA SOUP WITH FRANKFURTERS

Dried Split Green Peas	67½ lb.
Sliced Onions	22½ ,,
Sliced Potatoes	18¾ ,,
Wheat Flour	4½ ,,
Salt	2¼ ,,
Hydrolysed Protein	1¼ ,,
M.S.G.	½ ,,
Ground Celery Seed	1¼ oz.
Ground White Pepper	⅓ ,,
Bacon	For stock
Frankfurters	As required

Bulk to 30 gallons with water.

The vegetables and bacon are boiled, and then the bacon is removed and diced for use as a garnish. When the vegetables are soft they are passed through a fine sieve, the other pasted ingredients added, the soup bulked to 30 gallons with water and the whole brought to the boil and simmered for 5 minutes.

Sliced frankfurters and diced bacon are placed in each plain No. 1 Tall can and the cans filled with hot soup. The cans are sealed and processed for 75 minutes at 240° F., and then water cooled.

CANNED CREAM OF CORN SOUP

Fresh Milk	6 gals.
Sweet Corn (fresh, quick-frozen or canned)	55 lb.
Butter	7½ ,,
Wheat Flour	6 ,,
Salt	3 ,,
Hydrolysed Protein	10 oz.
M.S.G.	10 ,,
Ground White Pepper	⅛ ,,

Bulk to 30 gallons with water.

If fresh or frozen corn is used, it is cooked with water until soft, then passed through a fine sieve. Canned whole kernel corn will require sieving but canned cream-style corn can be used directly. The rest of the ingredients are added and well mixed and then bulked to 30 gallons with water. The soup is brought to the boil and simmered for 5 minutes. It is then filled hot into plain No. 1 Tall cans, sealed and processed for 75 minutes at 240° F., and then water cooled.

CANNED VEGETABLE SOUP

Carrots (diced)	36½	lb.
Onions (rings)	26½	,,
Tomato Purée (30 per cent solids)	14½	,,
Dried Peas (soaked)	12½	,,
Wheat Flour	10	,,
Potatoes or Swedes (diced)	7½	,,
Dried Beans (soaked)	7½	,,
Noodles (alphabet)	6½	,,
Sugar	3½	,,
Salt	3¼	,,
M.S.G.	1	,,
Protex C.S.C.	13	oz.
Saromex Garlic (on salt)	1½	,,
Ground White Pepper	1	,,

Bulk to 30 gallons with water.

Mix the dry ingredients with water to form a smooth paste, then add the prepared vegetables, etc., and bulk to 30 gallons with water. Bring to the boil and simmer for 5 minutes, with stirring. Fill hot into plain No. 1 Tall cans, seal, and process for 1¼ hours at 240° F. Water cool.

CANNED FRENCH STYLE ONION SOUP

Onions, sliced	90	lb.
Wheat Flour	11¼	,,
Butter	7½	,,
Salt	3	,,
Sugar	1¾	,,
Protex Standard	1¾	,,
Beef Extract	1	,,
Yeatex	1	,,
M.S.G.	6	oz.
Saromex White Pepper (on salt)	½	,,
Saromex Thyme (on salt)	½	,,
Saromex Bay (on salt)	¼	,,

Bulk to 30 gallons with water.

Cook the sliced onions in the butter in a boiling pan until they are golden brown in colour. Whisk the other ingredients with water to form a smooth paste and add this to the onions. Bulk to 30 gallons with water, bring to the boil and simmer for 5 minutes. Fill hot into plain No. 1 Tall cans, seal and process for 1¼ hours at 240° F. Water cool.

CANNED CREAM OF TOMATO SOUP NO. 1

Tomato Purée (30 per cent solids)	50 lb.
Onions, chopped	30 ,,
Vegetable Fat	15 ,,
Sugar	12½ ,,
Soyolk A	7½ ,,
Wheat Flour	5 ,,
Salt	5 ,,
Skimmed Milk Powder	5 ,,
M.S.G.	8 oz.
Ground White Pepper	4 ,,
Ground Mace	½ ,,
Sodium Bicarbonate	Sufficient to adjust finished soup to pH 4·6–4·7

Bulk to 50 gallons with water.

The chopped onions can be pre-cooked in water if desired. It is advisable to homogenize the other ingredients separately and then to add to the starch ingredients, to minimize curdling. Otherwise bulk the ingredients to volume with water and mix thoroughly in a steam-heated kettle. Bring to the boil and simmer for 5 minutes, then homogenize at 3,000 p.s.i. while hot. Fill hot into plain No. 1 Tall cans and seal and process at 225° F. for 1¼ hours and finally water cool.

CANNED CREAM OF TOMATO SOUP NO. 2

Tomato Purée (30 per cent solids)	68 lb.
Sugar	18 ,,
Skim Milk Powder	17 ,,
Butter	10 ,,
Cornflour	5½ ,,
Salt	4 ,,
Protex No. 8	10 oz.
M.S.G.	10 ,,
Saromex Onion (on salt)	8 ,,
Saromex Garlic (on salt)	1 ,,
Saromex Pepper (on salt)	½ ,,
Sodium Bicarbonate	Sufficient to adjust finished soup to pH 4·6–4·7

Bulk to 30 gallons with water.

Bulk to volume and whisk vigorously in a stainless steel steam-heated pan, fitted with a stirrer. Bring to the boil and simmer for 5 minutes. Homogenize at 1,500–2,000 p.s.i. and 180° F., and fill into plain No. 1 Tall cans at 200° F. Seal and process at 225° F. for 1¼ hours and water cool. The pH of the processed soup should be 4·6–4·7.

CANNED MULLIGATAWNY SOUP

Wheat Flour	30	lb.
Minced Beef	30	,,
Tomato Purée (30 per cent solids)	13½	,,
Apples	13½	,,
Onions	11	,,
Beef Dripping	10½	,,
Mango Chutney	7½	,,
Sugar	6	,,
Curry Powder	5½	,,
Carrots	5½	,,
Salt	5½	,,
Protex Standard	13	oz.
Paprika	13	,,
M.S.G.	13	,,
Turmeric	6½	,,
Caramel	6	,,
Ground Marjoram	1	,,
Ground Thyme	1	,,
Ground Cloves	1	,,

Bulk to 50 gallons with water.

The prepared and chopped carrots, onions and apples are covered with water and cooked until soft. This mixture with the mango chutney is passed through a fine sieve to make a purée. All the other ingredients are mixed with water to form a smooth paste and the purée added. The mixture is bulked to 50 gallons with water, brought to the boil and simmered for 5 minutes. The hot soup is filled into plain No. 1 Tall cans, to which ½ oz. blanched rice has been added. The sealed cans are processed for 1½ hours at 240° F., then water cooled.

CANNED CHICKEN BROTH

Salt	1 lb. 14 oz.
M.S.G.	10 oz.
Onion Powder	5 ,,
Ground Celery Seed	½ ,,
Ground Bay Leaves	½ ,,
Ground White Pepper	½ ,,
Caramel	As required

Bulk to 30 gallons with chicken stock.

Chicken stock is prepared by retorting dressed chickens until tender. The bones and giblets are processed further with the drained liquor for one hour longer. The fat is then skimmed from the stock and the seasoning added. The broth is brought to the boil and filled hot into No. 1 Tall plain cans, each containing about ½ oz. of diced white chicken and ½ oz. of blanched Patna rice. The cans are sealed, processed for one hour at 240° F., and then water cooled.

CANNED MOCK TURTLE SOUP

Chopped Beef	24	lb.
Carrots	24	,,
Onions	24	,,
Tomato Purée (30 per cent solids)	19	,,
Wheat Flour	14	,,
Salt	3½	,,
Hydrolysed Protein	2	,,
Yeatex	2	,,
Lemon Juice	2	,,
M.S.G.	1½	,,
Caramel	½	,,
Ground Thyme	1½	oz.
Bay Leaves	1	,,
Ground Coriander	½	,,
Ground Paprika	½	,,
Ground White Pepper	½	,,

Bulk to 40 gallons with beef bone stock.

Boil beef bones in water for 2 hours to prepare a beef bone stock. Strain and remove fat from stock before use. Prepare and chop the vegetables and cook in water with the bay leaves until tender. Remove the bay leaves and sieve the vegetables to form a purée. Mix the rest of the ingredients with stock to orm a smooth paste. Add the chopped beef and the vegetable urée and bulk to 30 gallons with stock. Boil the soup, simmer or 5 minutes, then fill hot into plain No. 1 Tall cans. Seal and rocess for 1¼ hours at 240° F., then water cool.

CANNED CREAM OF MUSHROOM SOUP

Milk	8½	gals.
Mushrooms, chopped	13	lb.
Amioca	7	,,
Butter	7½	,,
Soyolk A	6½	,,
Salt	2½	,,
Sugar	1¾	,,
Onion Powder	15	oz.
M.S.G.	15	,,
Protex No. 8	10	,,
Ground White Pepper	1½	,,

Bulk to 30 gallons with water.

Mix the dry ingredients with sufficient milk to form a mooth paste. Add the chopped mushrooms and the remainder of the milk and bulk to 30 gallons with water. Bring to the oil, simmer for 5 minutes, then fill hot into plain No. 1 Tall ans. Seal and process for 1¼ hours at 240° F. Water cool.

CANNED CREAM OF CELERY SOUP

Milk	12	gals.
Celery	75	lb.
Butter	15	,,
Wheat Flour	11	,,
Salt	3	,,
M.S.G.	10	oz.
Protex C.S.C.	10	,,
Ground White Pepper	1	,,
Ground Bay Leaves	½	,,

Bulk to 30 gallons with water.

Macerate the celery in a suitable machine and mix the other ngredients to a smooth paste. Add the celery, mix and bulk o 30 gallons with water. Bring to the boil, simmer for 5 minutes, hen fill hot into plain No. 1 Tall cans. Seal, process at 240° F. or 1¼ hours, then water cool.

CANNED LENTIL SOUP

Lentils	61 lb.
Wheat Flour	8 ,,
Margarine	6½ ,,
Salt	2 ,,
M.S.G.	1¼ ,,
Onion Powder	11 oz.
Protex No. 8	5 ,,
Ground White Pepper	1 ,,

Bulk to 30 gallons with stock.

Place the lentils in a fine mesh sieve and boil until soft, in water containing bacon bones and scraps. Remove and sieve the lentils to form a purée and to it add the rest of the ingredients. Bulk to 30 gallons with strained bacon stock, bring to the boil and simmer for 5 minutes. Fill into plain No. 1 Tall cans, seal and process for 75 minutes at 240° F. Water cool.

CANNED BROWN WINDSOR SOUP

Carrots	20 lb.
Parsnips	20 ,,
Swedes	20 ,,
Onions	20 ,,
Margarine	11½ ,,
Wheat Flour	11 ,,
Beef Extract	6 ,,
Salt	2 ,,
Hydrolysed Protein	1 ,,
Yeatex	½ ,,
M.S.G.	1 oz.
Ground White Pepper	⅔ ,,
Caramel	As desired

Bulk to 30 gallons with water.

Place the margarine in a steam-jacketed boiling pan, fitted with a stirrer and brown the chopped prepared vegetables in it. Add the flour and allow to brown, then the rest of the ingredients. Stir well during the preparation and simmer the soup until the vegetables are tender. Pass the soup through a sieve so that the vegetables form a purée, then rebulk to 30 gallons with water. Bring to the boil and fill hot into No. 1 Tall plain cans. Seal, process at 240° F. for 1¼ hours, then water cool.

CANNED MEAT SOUP

Chopped Onions	30 lb.
Minced Beef	27 ,,
Chopped Carrots	21 ,,
Wheat Flour	12 ,,
Salt	3 ,,
Hydrolysed Protein	1½ ,,
M.S.G.	4½ oz.
Ground White Pepper	2 ,,
Caramel	As required
Beef Bones (for stock)	

Bulk to 30 gallons with stock.

Boil the beef bones, carrots and onions in water for approximately two hours. Remove the bones, strain the stock and purée the vegetables. Mix the dry ingredients to a smooth paste with water, add to the vegetable purée and bulk to 30 gallons with stock. Bring the soup to the boil, simmer for a few minutes and fill into No. 1 Tall plain cans. After sealing, process the cans at 240° F. for 75 minutes and water cool.

CANNED CREAM OF CHICKEN SOUP

Chicken Stock	15 gals.
Milk	11½ ,,
Wheat Flour	16 lb.
Butter	9 ,,
Salt	2½ ,,
Protex No. 8	1 ,,
M.S.G.	10 oz.
Onion Powder	10 ,,
Sugar	6 ,,
Saromex Celery (on salt)	4 ,,
Ground White Pepper	1 ,,

Cover dressed chickens and giblets with water and retort until the flesh comes away easily from the bones. Drain off liquor and retain for stock. Remove flesh from bones and use diced as a garnish. Digest the bones, skin and giblets in water for 1 hour at 250° F. in a retort. Drain and add this liquor to the original liquor. This is the chicken stock. Whisk the flour with the milk to a smooth paste and add to the rest of the ingredients which have been brought to the boil in a stainless steel steam-heated jacketed pan, equipped with a stirrer.

Homogenize at 1,500–2,000 p.s.i. and hold at 180°–200° F. prior to filling. Place ½–¾ oz. of diced chicken meat in each plain No. 1 Tall can and fill with soup. Process, after sealing, for 75 minutes at 240° F. and water cool.

Yield: approximately 30 *gallons.*

CANNED TOMATO SOUP

Tomato Purée (30 per cent solids)	73	lb.
Sugar	13	,,
Wheat Flour	4½	,,
Salt	3	,,
Onion Powder	13	oz.
Protex No. 8	6	,,
Sodium Bicarbonate	6	,,
Ground White Pepper	⅕	,,

Bulk to 30 *gallons with water.*

Mix the dry ingredients into a smooth paste with the water, then add the tomato purée and bring to the boil. Allow to simmer for several minutes. Fill No. 1 Tall plain cans with the hot soup, seal and process for 75 minutes at 225° F. and water cool. The amount of sodium bicarbonate given in the recipe is intended as a guide and the exact amount required should be determined on the tomato purée used and for each batch of soup. The pH of the soup before processing should be 4·6–4·7.

CANNED KIDNEY SOUP

Chopped Onions	30	lb.
Chopped Carrots	30	,,
Wheat Flour	15	,,
Salt	2½	,,
Yeatex	1	,,
Protex Standard	1	,,
M.S.G.	10	oz.
Ground White Pepper	½	,,
Caramel	As required	
Beef Bones (for stock)		

Bulk to 30 *gallons with stock.*

Simmer the carrots, onions and beef bones with water for approximately two hours. Remove the bones and purée the vegetables. Place 1 oz. of chopped raw kidney into each No. 1 Tall plain or meat-lacquered can. Mix the remaining ingredients to a smooth paste with cold stock and add to the vegetable purée. Make up to volume with stock, bring to the boil and simmer for 5 minutes. Fill into the cans, seal and process at 240° F. for 75 minutes and water cool.

CANNED MINESTRONE SOUP

STOCK:

Beef Bones	160 lb.
Bacon Trimmings	40 ,,
Carrots	16 ,,
Onions	16 ,,
Beef Dripping	16 ,,
Tomato Trimmings	3½ ,,

Bulk to 30 gallons with water.

SEASONING:

Salt	3½ lb.
M.S.G.	½ ,,
Protex C.S.C.	½ ,,
Ground White Pepper	1 oz.
Parsley	1 ,,

TO CLEAR STOCK:

Minced Beef	32 lb.
Egg Whites	150 ,,

GARNISH:

	Per cent
Carrots (diced or strips)	22
Onions (chopped)	16
Tomato (without seeds)	16
Peas	16
Spaghetti	10
Rice	10
Haricot Beans	10
	100

The bones, chopped vegetables and trimmings are fried in the beef dripping. The mixture is bulked to 30 gallons with water and the stock is boiled for at least 2 hours. The strained stock is then allowed to cool, after which the fat is skimmed off. The minced beef and egg whites are mixed and added to the cold stock. This is brought to the boil and simmered for 30 minutes, with occasional stirring. The soup is finally strained, reheated, then filled hot into plain No. 1 Tall cans, into each of which 2 oz. of the prepared garnish has been placed. The sealed cans are processed for 1¼ hours at 240° F., then water cooled.

CANNED CREAM OF ONION SOUP

Milk	11	gals.
Onions, Chopped	108	lb.
Butter	13½	,,
Wheat Flour	12½	,,
Salt	2¾	,,
M.S.G.	9	oz.
Protex C.S.C.	9	,,
Saromex White Pepper (on salt)	¾	,,
Saromex Bay (on salt)	¼	,,

Bulk to 30 gallons with water.

Mix the dry ingredients to a smooth paste with the milk. Add the chopped onions and bulk to 30 gallons with water. Bring to the boil and simmer for 5 minutes. Fill hot into plain No. 1 Tall cans, seal and process for 1¼ hours at 240° F. Water cool.

CHAPTER IV

SOUP CANNING AND PROCESSING

THE degree of mechanization and therefore the number of machines used for actual filling and processing canned soups naturally depends upon the scale of production. But however large or small the production may be, the various steps are the same, as is the general technique.

1. *Filling*

The first operation is usually to fill the empty cans with any garnish which is to be used. This may be diced vegetables, oxtail, chicken meat and so on. This operation may be undertaken on an ordinary table, or on a moving conveyor running between table tops or suitable bins. In either case, it is most important that the cans be cleaned before use. This may be done by hand or, where a conveyor feed is used, the cans may be inverted and either blown clean with compressed air or washed with hot water. Considerable trouble can arise at this point of production from two causes.

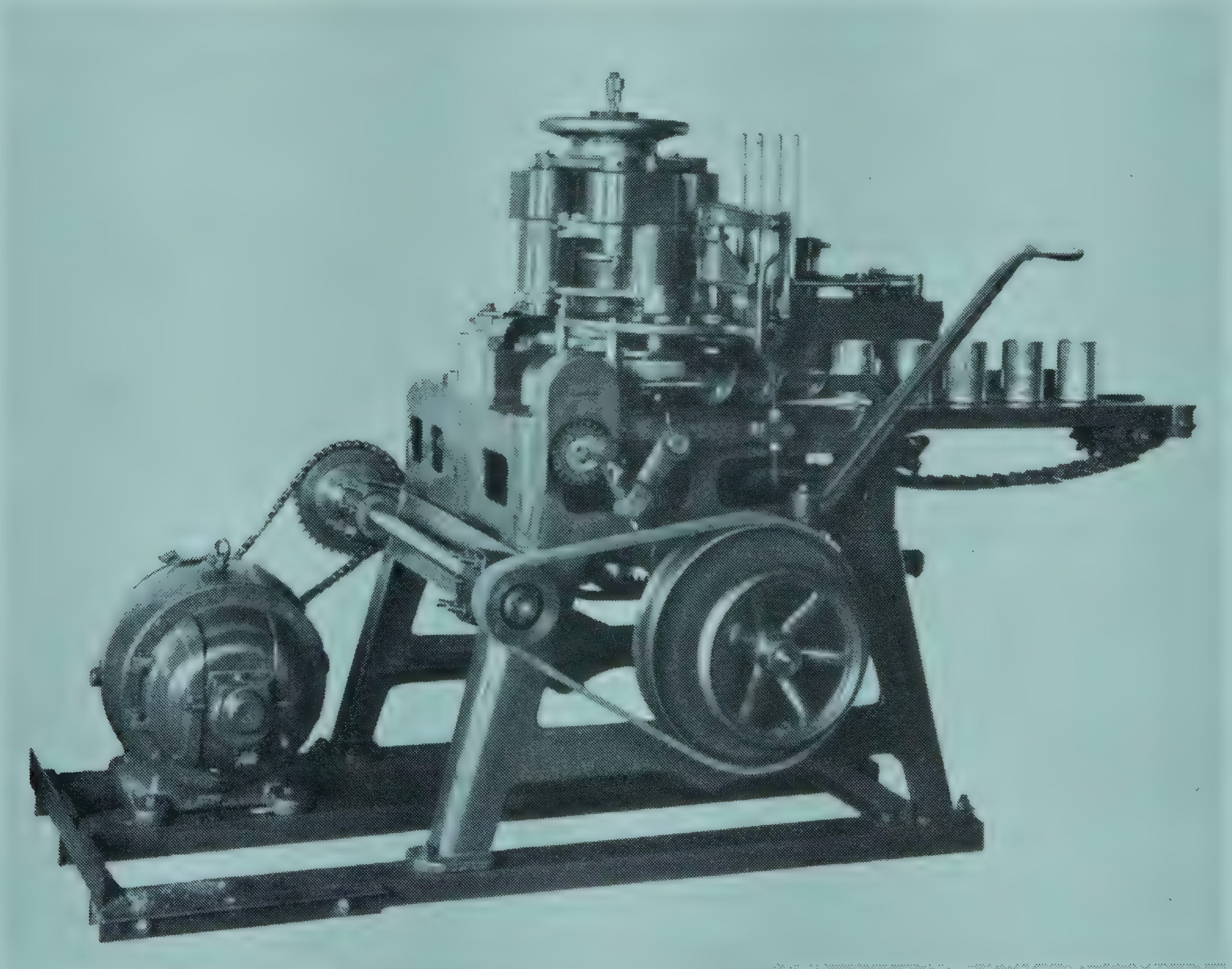
Firstly, through the use of either too large or badly constructed garnish-holding vessels, leading to bacteriological contamination due either to food being left in the crevices of the containers or just being held too long in too great a bulk. Secondly, through improper checking of the amount of garnish added to each can. This last trouble can be controlled to a degree by use of specially made scoops of the right size for each product handled, but even then, this part of the line needs constant supervision. It is of course possible to buy automatic fillers which will fill standardized quantities of certain items into the cans, but it is not possible to obtain any one machine which will deal with everything.

After the filling of solids, the cans pass to the actual soup-filling stage. This again, may be done by hand from a jug or perhaps by means of a trigger valve on a hose connected to an overhead tank. Again, the cans may be fed automatically to a soup filler which will fill the cans accurately at speeds up to

150 or even 300 per minute. Some of these machines will also deal with solids such as diced vegetables.

Quite a good filling machine of comparatively simple design, which is not too costly, may be either purchased or made by the user. This consists of a straight conveyor on which the cans run under a number of nozzles from which the soup pours in a continuous stream. The soup supply, either from a tank or from a pump is controlled by a valve, and provided that the cans are fed so that they each touch the one next on the conveyor and, provided that the flow rate is even, cans may be filled quite accurately by this system without serious spillage.

Whatever method of filling is used, it is most essential that the temperature of the soup be maintained at at least 175° F. at the seaming point. This means that the soup must be filled very hot, or else an expensive and in this case rather unnecessary steam exhaust box must be installed. In some of the latest canneries there is an arrangement whereby a small jet of superheated steam is injected into the headspace of the can



(By courtesy The Metal Box Co. Ltd.)

THE M.B. 3-C CLINCHER

just before the end is put on, thus ensuring that all the air is removed from the headspace and a good final vacuum results. In this respect, it should be noted that cans should never be filled quite full, but a small space allowed for expansion during retorting. This space must be evacuated and this can only be done by having the soup hot enough to fill the headspace with water vapour, or by using the steam-jet method.

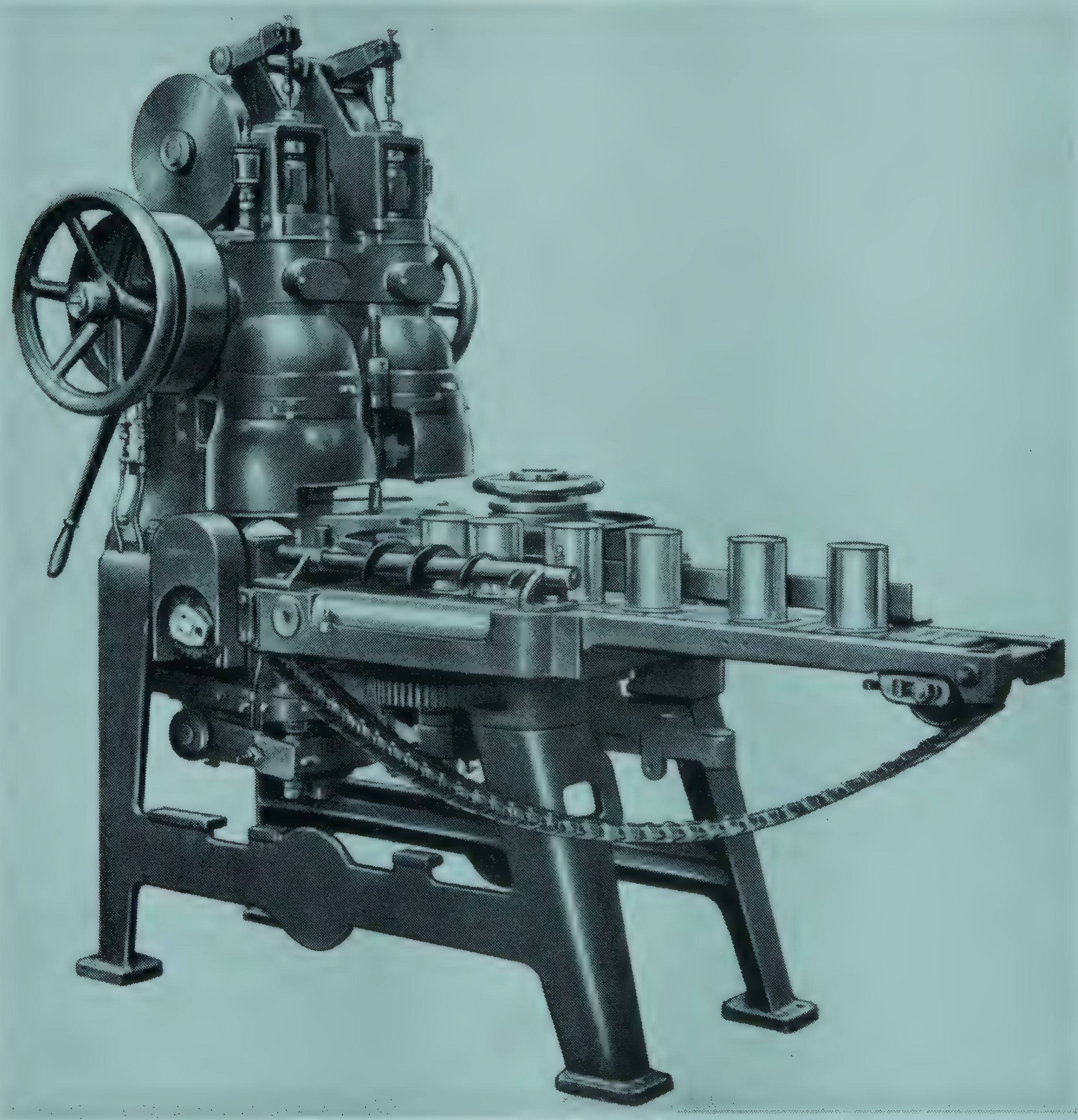
There are many reasons why canned foods must be sealed under vacuum, or at least in such a manner that a vacuum will result when the can is cooled. The technical reasons for this belong more properly to a book on canning technology, but broadly they are as follows:

1. If air is left in the headspace of a can, this air will expand enormously when the can is heated in the retort and lead to straining or even bursting of the can.
2. Air left in the can, especially if there is no vacuum at all, may lead to apparent blowing of the can on the grocer's shelf in warm weather, due to the expansion of the air. It should perhaps be noted that the rate of expansion of air when heated is many times that of water.
3. Air in the can will lead to oxidation of the food in the can, and thus to the formation of off-flavours, vitamin loss, loss of colour and flavour and rancidity of fat.
4. Air in the can, in the presence of water also, will lead to an eventual rusting through of the can from the inside. This is known as pinholing. This fact may be explained simply by stating that water alone does not cause rust, it is always water plus air. For example, an iron post driven into a river will always rust at the point where the post enters the water.

The actual seaming of the cans has to be done on a machine of some kind. The only difference here is whether the machine is hand operated and fed, semi-automatic or fully-automatic. In most cases a fully-automatic machine is desirable for soups as they are hot and spill very easily if manhandled.

At this stage, it is most desirable to mark the cans in some way, because as they are not yet labelled it is otherwise difficult to be sure of the contents. The same marking, if it is permanent, may be used to identify the can for years after it has been sent out, should it be sent back for any reason, even without a label.

Code marking, for date and batch number, etc., may be carried out by the use of special inks and stampers, by hand, or automatically, or more simply by making a suitable impression in the lid end which is put on to the can. Most fully-automatic seaming machines have a device for impressing letters and numbers on to the lid ends of the cans, but where such machines are not used, a small treadle-operated stamper may be obtained. Whichever type of stamper is used, however, when the actual can is indented great care must be taken to see that the impression is not too deeply cut. If the numbers or letters are too deeply cut into the can end, this may damage the internal lacquer of the can, or externally the tinplate,

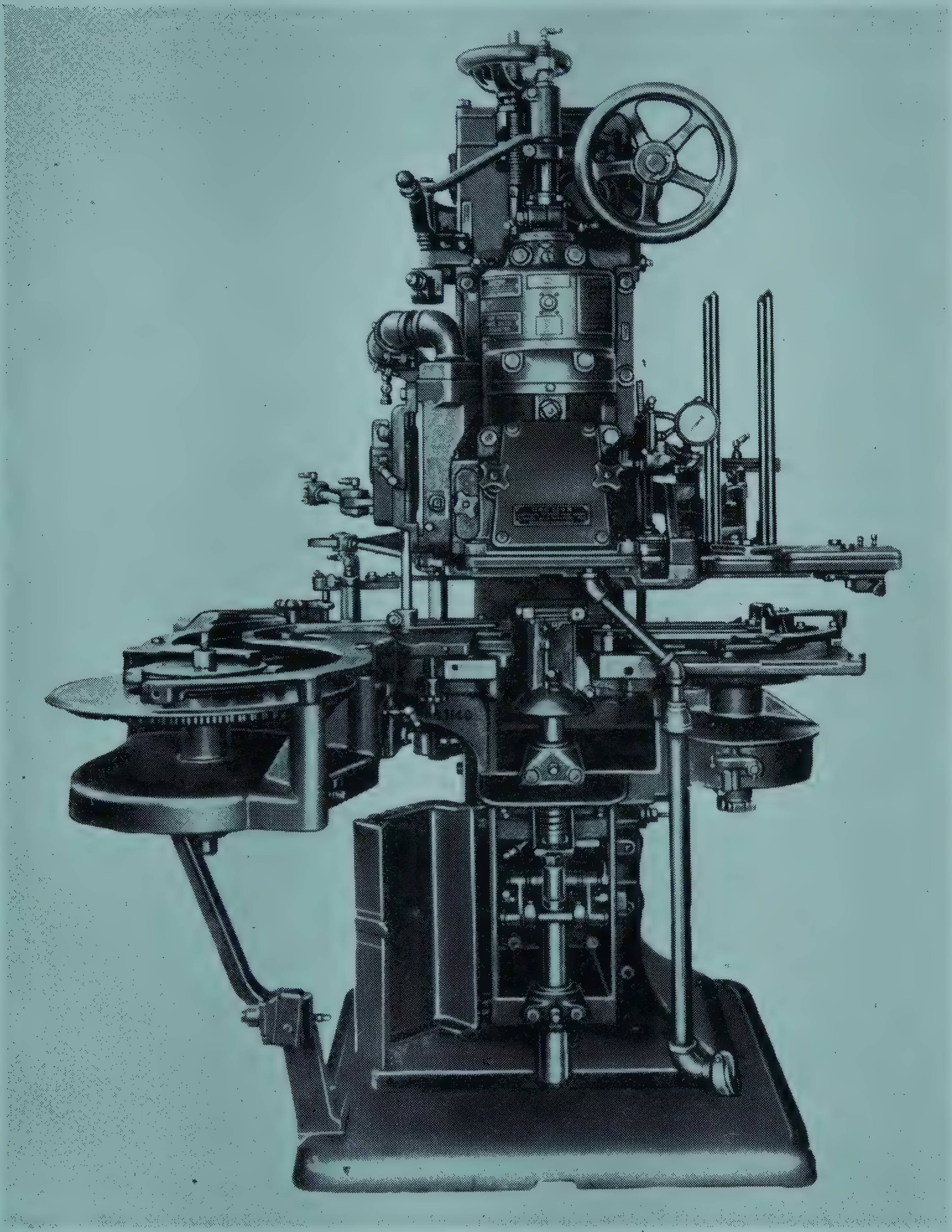


(*By courtesy The Metal Box Co. Ltd.*)

The MB 9A Double Seamer. This is an automatic continuous power seamer machine, for operating in conjunction with the M.B. 3-C Clincher. Cans remain stationary during the seaming operation.

leading to premature rusting. In extreme cases the can end is sometimes cut right through.

As cans come from the seamer, they are packed into metal crates to be placed into the retorts. The shape of these crates will of course depend upon the type of retort to be used. However, unless flat trays are used the crates are all fairly deep and

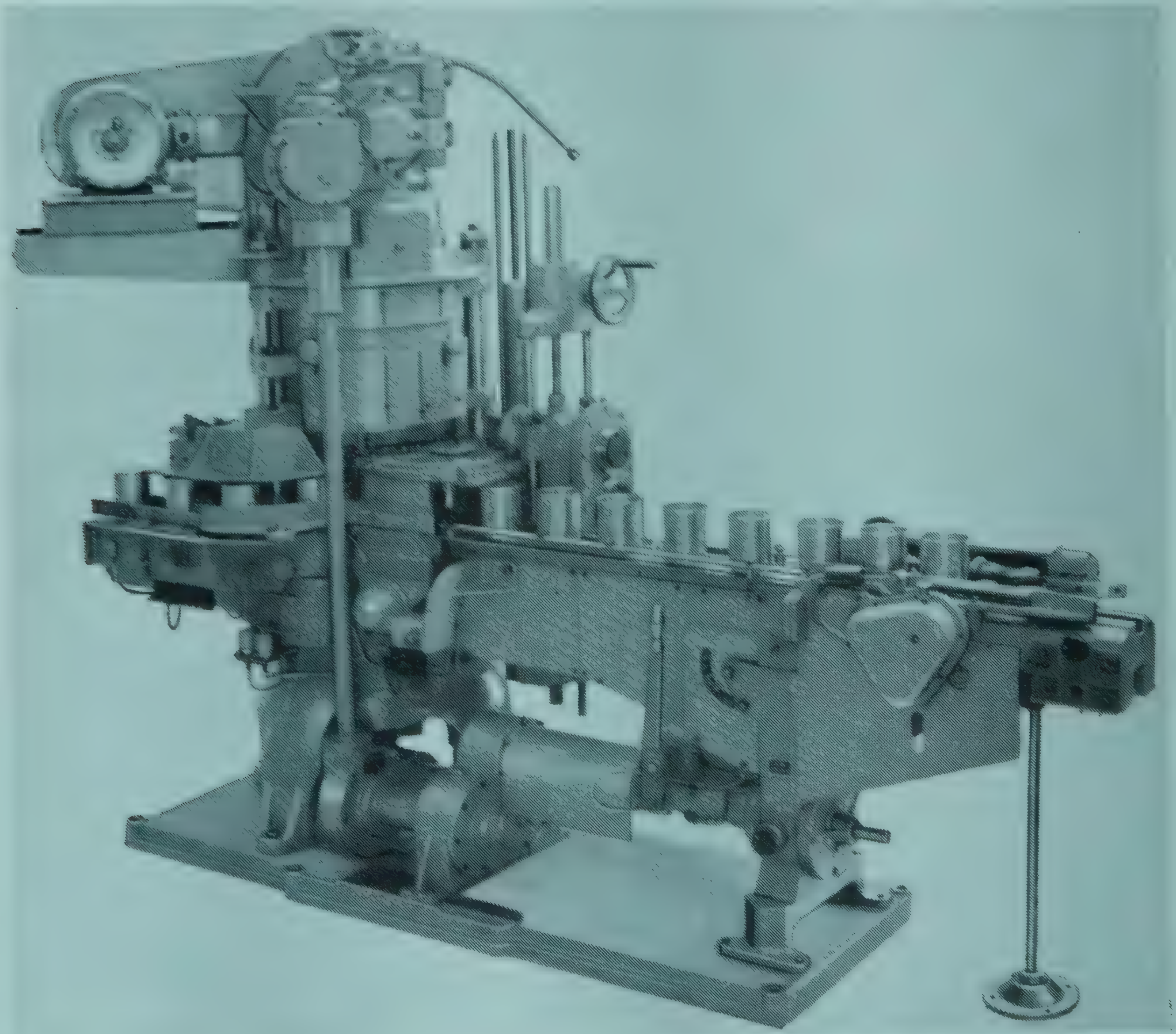


(By courtesy The Metal Box Co. Ltd.)

The M.B. No. 6 Vacuum Closing Machine for all sizes of cans up to A2½.

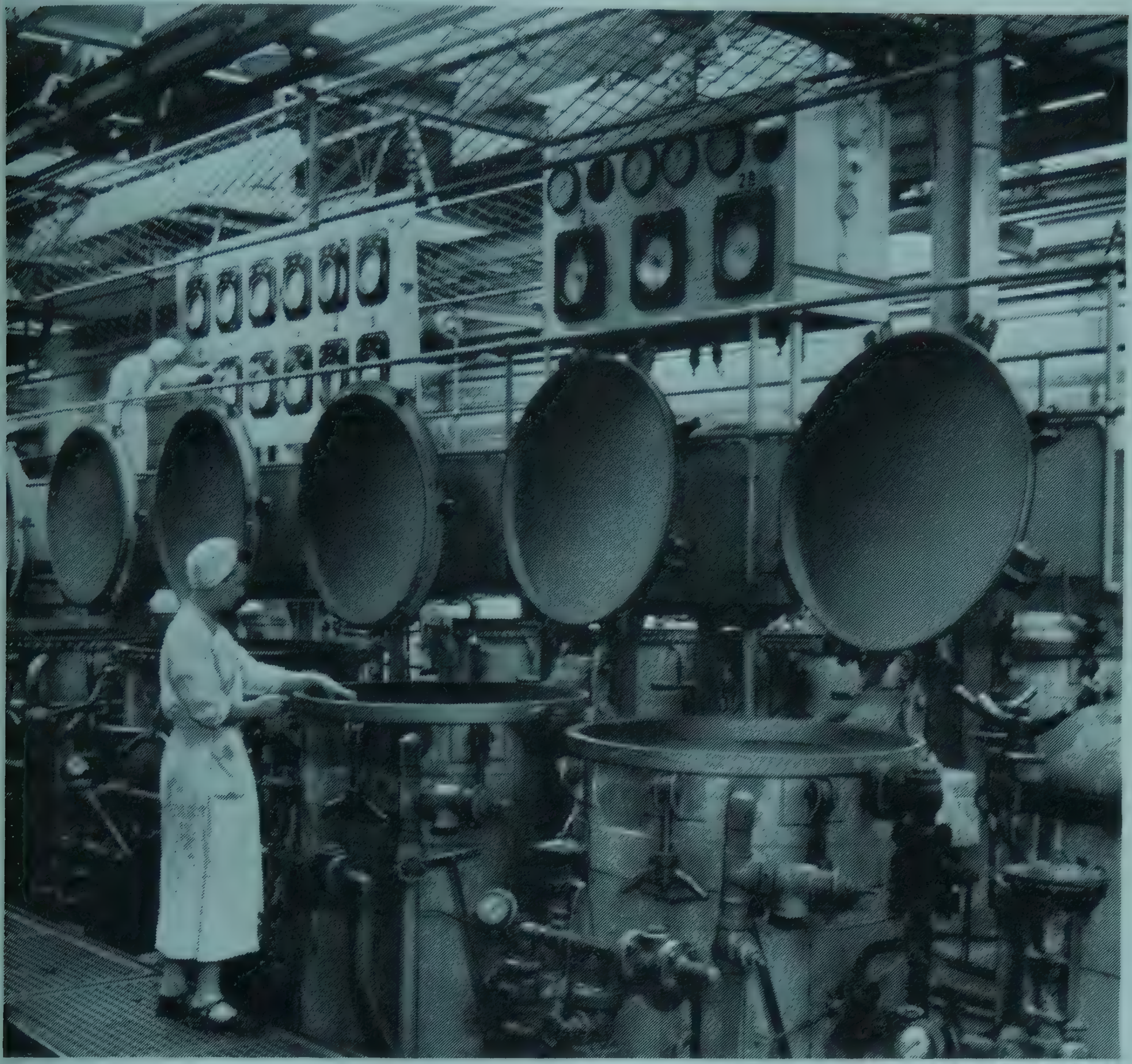
there are several methods of packing the cans. Some canners place the cans into the crates all jumbled up or "scrambled", whilst others place them in in definite layers one on top of the other. On the whole the layer method is best for canned soups as if the cans are scrambled or even laid in layers on their sides, they tend to become dented as the end seam of one can pushes into the side of another.

The handling of cans from the seamer into the retort crates, and for that matter out again, after sterilization, is one of the most labour-consuming tasks in the cannery, especially where production is large, but it is in fact usually done by hand in this country. In America, three different methods are adopted to eliminate much of the hand work in this operation. In system number one, the cans are presented to the retort crate loader on their ends on a conveyor. The loader has a long bar-like pipe with handles on the ends, rather like bicycle



(By courtesy The Metal Box Co. Ltd.)

THE MB CRS/C SEAMER



(By courtesy Batchelors Foods Ltd.)

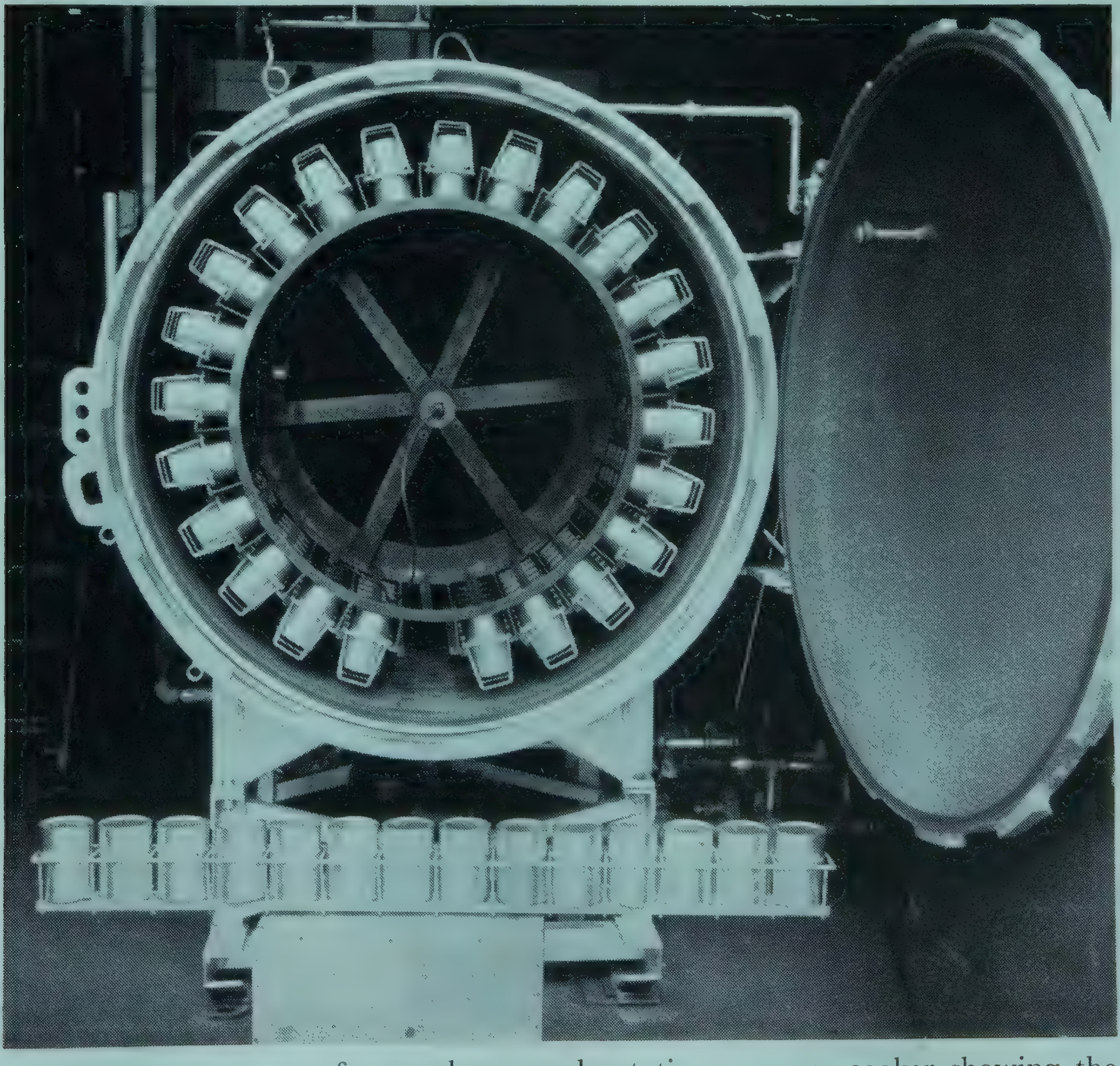
View showing a battery of vertical retorts with controller recorders mounted on panels above.

handlebars, on which are fitted eight or so nozzles with rubber sucker ends. The whole apparatus is connected to a vacuum line and mounted on an overhead pulley with counterweights. The operator places the bar so that the nozzles descend on to a line of eight cans and by means of a trigger exerts a vacuum suction on to the cans, thus lifting them with the bar. The whole eight cans are then lowered into the crate and the vacuum broken by a reverse motion of the control trigger. This is a very simple and labour-saving method which might well be copied in this country.

System number two, which is more complicated, consists of a revolving plate the size of the crate, on to which the cans are fed by a conveyor until it is full. A large electro-magnet then automatically descends and lifts the whole plateful of cans up and swings them round so that they can be deposited gently into the crate by releasing the magnetic force. System three is even more complicated and calls for special crates with a hole in the middle which are placed down upon an hydraulic ram set in the floor. The crate has a solid plate false bottom which is then raised by the ram so that the cans can be slid on to it by a conveyor and pusher arm. When this is full, the plate is lowered to allow the second layer to be put on top of the bottom layer of cans. In all cases, emptying is carried out in the same manner.

In very large canneries soups are sometimes sterilized in continuous automatic retorts, into which the cans are fed in a continuous stream. However, production has to be very large to warrant this, although there are undoubtedly many advantages to this system.

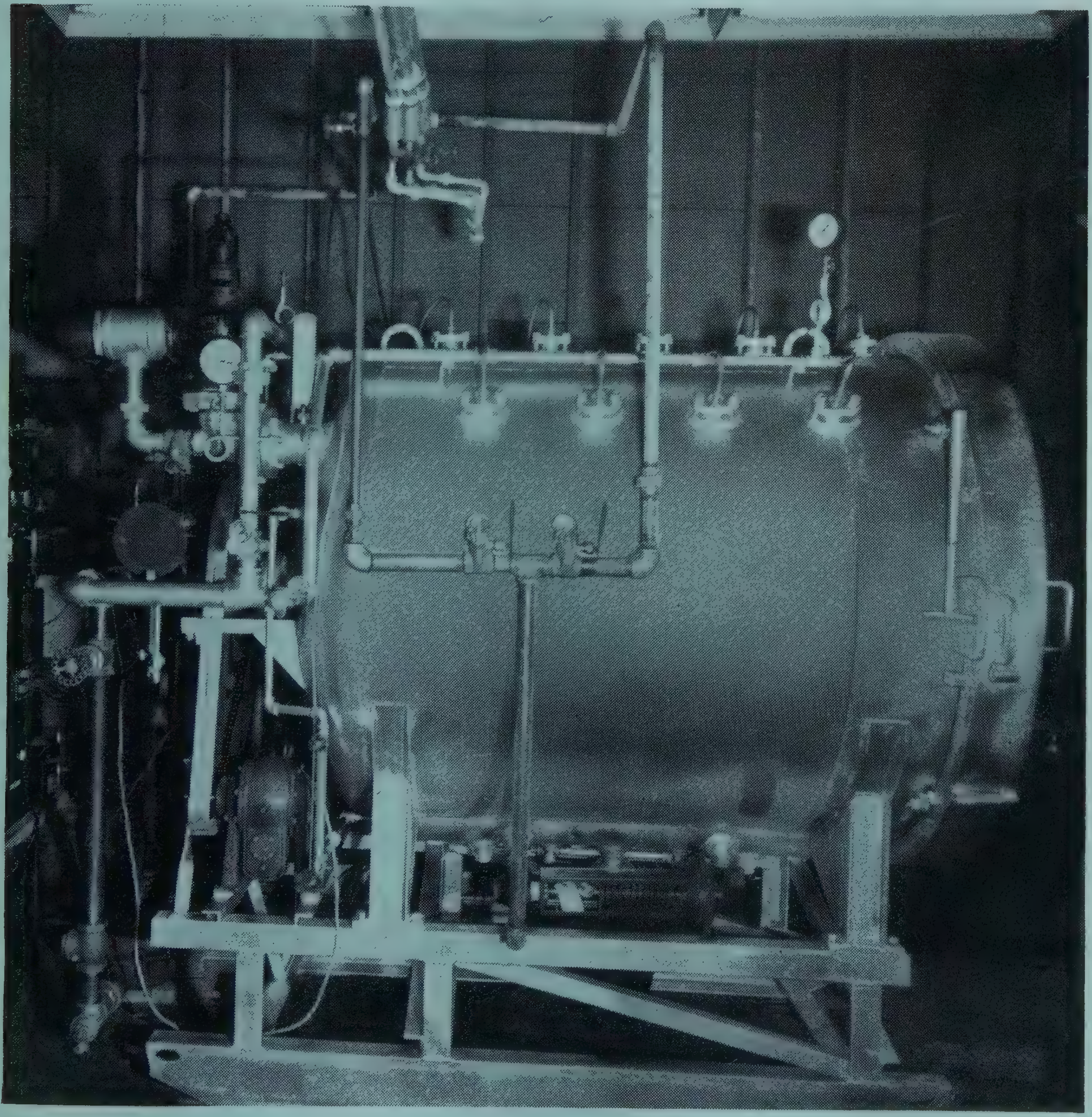
In most cases, either vertical or horizontal batch retorts are used and in the case of soup it does not matter much which



Interior arrangement of an end-over-end rotating pressure cooker showing the principle of movement as distinct from the standard rotary cooker/cooler.

type is used and probably the odds are in favour of the vertical type. Horizontal retorts are either round or rectangular in cross-section with a door at one end and they are charged by means of small trolleys which carry the crates and run in on rails. There is no doubt that the round horizontal retort gives the best steam circulation with less risk of cold spots or air pockets, but unless very large-scale operations are undertaken, vertical retorts are easiest to charge and work generally. Vertical retorts are round and are usually set in a row in a pit, so that the tops are at a reasonable level from the floor. In this case, the baskets or crates are charged into them by means of an overhead hoist running along a joist.

Batch retorts vary a good deal in size and when laying out a cannery it is necessary to match the size reasonably with the



A typical end-over-end rotating pressure cooker.

output required. That is to say, arrangements must be made so that a retort can be filled and put into operation at least every forty minutes or so. It is useless to have a retort so big that it takes an hour or so to produce enough cans to fill it. If hot cans are allowed to lie around waiting for sterilization, bacteria are apt to multiply in the cans and this may lead to souring.

The retorting cycle is fairly simple and consists of a "coming-up" period, while the retort and the cans are warming up to the actual sterilization temperature; the sterilization time itself and a cooling down period.

When the cans are put into the retort and the lid fastened down, the steam is turned on and the temperature begins to rise. During this period, however, there will be a great deal of condensed water to be got rid of and also all the air in the retort itself must be displaced by steam. For this reason, the bottom drain is usually left partly open as are the air vent pet-cocks on the top of the retort. It is quite a good idea to have a small permanent hole tapped across the drain-off valve at the bottom so that excess condensate is always allowed to drain away at all periods of the process. Once the air has stopped coming from the pet-cocks and steam is coming out freely, they may be closed and the temperature allowed to rise to the required level. The temperature should, however, be contantly checked against the steam pressure in the retort and if the pressure is in excess of the corresponding temperature, then air must be bled off through the pet-cocks.

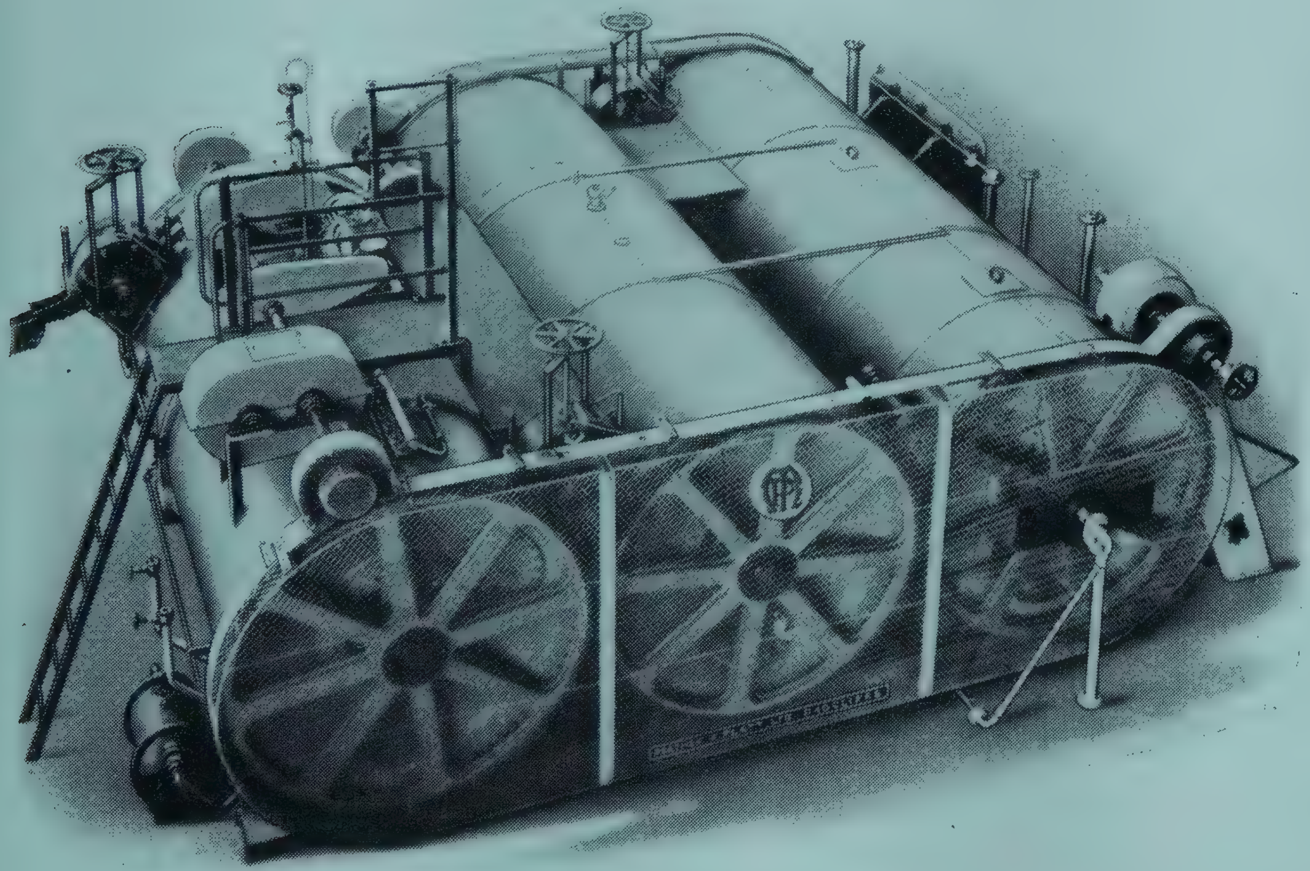
The actual temperature employed and the duration of the retorting time will depend upon the size of the can and the nature of the contents. Cans with solids in them, such as oxtail garnish, will take longer than those which are all liquid. Again, the higher the temperature, the shorter the period. Temperatures from 230° F. to 260° F. are employed, but obviously the higher the temperature the greater the risk of scorching the contents of the can. In most cases, the higher temperature ranges are only used in the continuous automatic retorts, where the cans are moving and the contents therefore agitated.

The most usual temperature for canned soups in a batch retort is 240° F. and the time for No. 1 Tall cans about $1\frac{1}{4}$ hours. It should be understood, however, that this is an average figure and actual times must be worked out most carefully.

At the end of the sterilization time, the steam should be turned off and at the same time the compressed air supply eased up, so that the pressure in the retort does not drop. The water valve is then opened slowly, at the same time increasing the air supply again, so that the pressure does not drop. The use of compressed air is continued until it is found that the water pressure is itself enough to maintain pressure, at which time the use of air may be discontinued. The pet-cocks may then be opened and water will eventually spurt out of them. The main water overflow valve may then be opened and water allowed to pass freely through the retort.

When the cans are reasonably cool (they should not be allowed to become quite cold) the retort may be drained off and the cans removed. If the cans are allowed to get too cold, they will not dry off when they are brought out and may therefore go rusty at the seams.

The above is only a very general description of the operations involved in cooling and the procedure may vary quite a lot according to the retort set-up. The cooling-down operation



(By courtesy Mather & Platt Ltd.)

AUTOMATIC ROTARY PRESSURE COOKER/COOLER

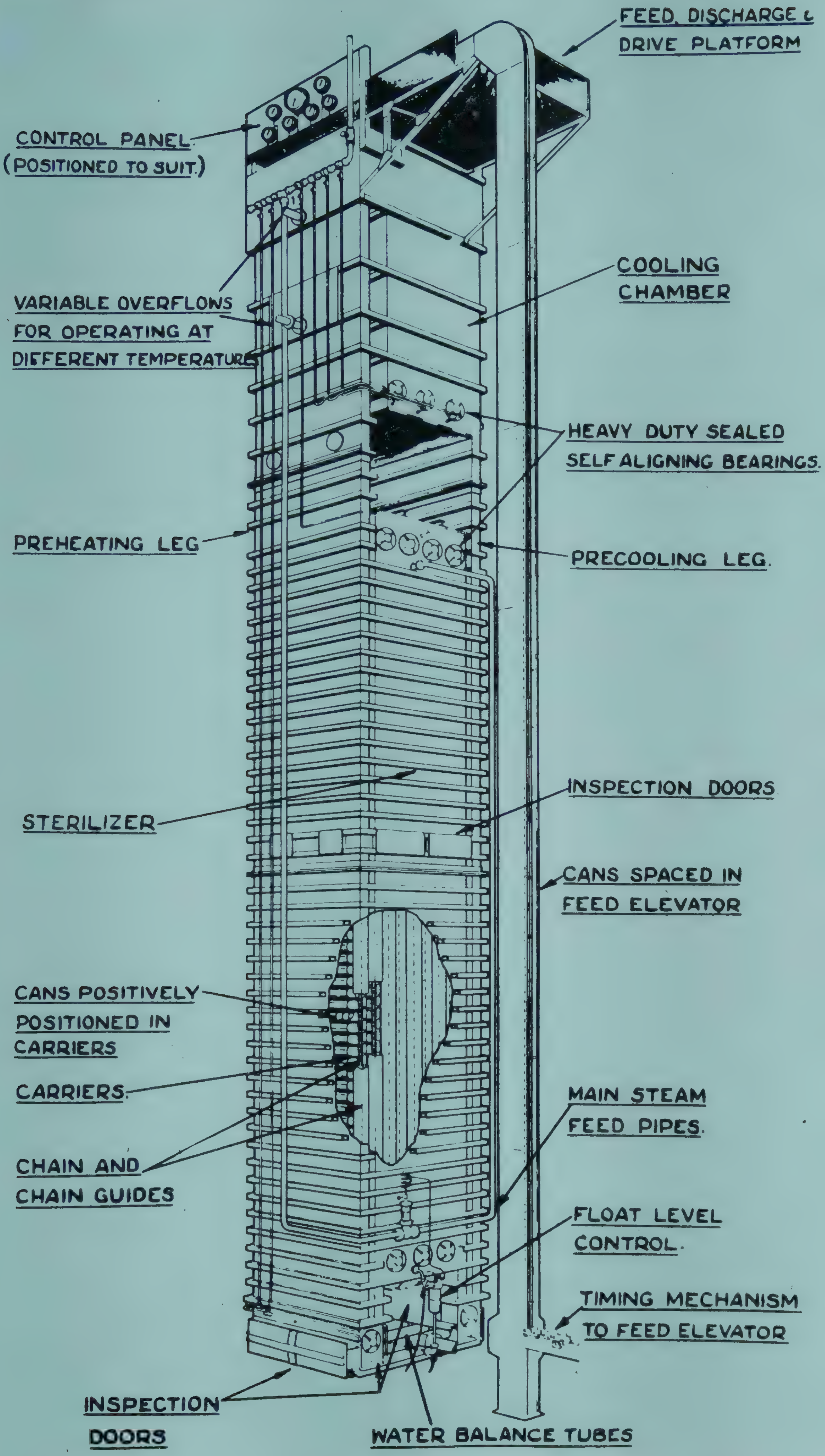
This machine is in three sections, each connected by pressure valves. The cans are brought up to temperature in the first section, processed in the second and are cooled in the third section.

is, however, rather critical, as during this stage it is very easy to undo the good work of sterilization or to ruin the cans by what is known as panelling, that is to say, causing the cans to collapse and dent in.

What actually happens inside the retort is this. While the cans are very hot during the actual sterilization process, the pressure inside the can is slightly greater than that in the retort itself and this causes the ends of the cans to bulge out. (It has already been pointed out that if the cans are not properly exhausted, the pressure will be great enough to burst the cans, because of the great expansion factor of air.) When the sterilization period is over the cans begin to cool, the steam inside the can condenses and causes a vacuum in the headspace. This pulls the ends back into their normal form as seen on the grocer's shelf. However, if cold water is suddenly poured into the retort, the steam will condense in the retort itself quicker than it does in the can, and a vacuum will be created in the retort, whilst there is still a pressure in the can. This will of course cause the cans to burst or at least will seriously strain the seams of the can. Thus, compressed air is used to prevent a vacuum forming in the retort when the water is turned on. Again, if the cans are cooled too quickly and too much air pressure is used, then the vacuum formed in the can, combined with the external pressure, may be enough to push in the sides of the can and cause what is known as panelling.

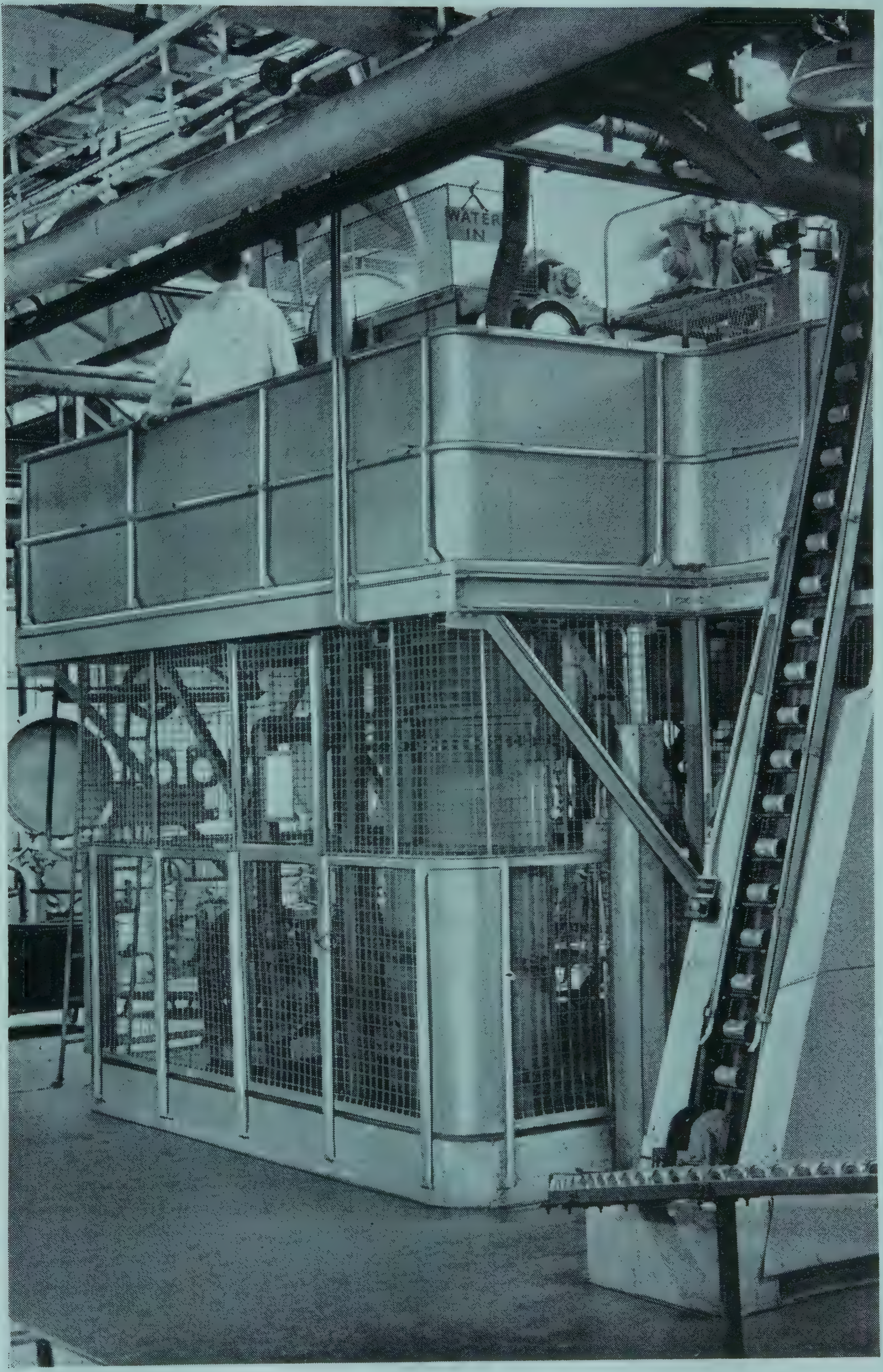
From the above, it will be seen that the aim must be to achieve a nice balance between the internal pressure or vacuum in the can and the pressure in the retort, to prevent excessive straining of the can seams. It should also be appreciated that at this stage, the rubber solution in the can seam is still hot and possibly molten and if the seams are unduly strained, especially when the end formation of the can reverts from convex to flat or concave, there is a grave risk that minute drops of water may be sucked into the can. If this water contains even one bacterium, then all the good work of sterilization will be undone. In most canneries, the water used for cooling is fairly heavily chlorinated, to minimize this risk.

In most small canneries, cooling of the cans is completed to the right stage in the retort itself, but in larger establishments, the cans are either passed along some sort of cooling conveyor with water sprays over it, or the complete crates are dipped in


FEED, DISCHARGE & DRIVE PLATFORM
CONTROL PANEL (POSITIONED TO SUIT)
COOLING CHAMBER
VARIABLE OVERFLOWS FOR OPERATING AT DIFFERENT TEMPERATURES
HEAVY DUTY SEALED SELF ALIGNING BEARINGS.
PREHEATING LEG
PRECOOLING LEG.
INSPECTION DOORS
STERILIZER
CANS SPACED IN FEED ELEVATOR
CANS POSITIVELY POSITIONED IN CARRIERS
CARRIERS.
MAIN STEAM FEED PIPES.
CHAIN AND CHAIN GUIDES
FLOAT LEVEL CONTROL.
TIMING MECHANISM TO FEED ELEVATOR
INSPECTION DOORS
WATER BALANCE TUBES

(*By courtesy Mather & Platt Ltd.*)

THE CARVALLO HYDROSTATIC STERILIZER.



General view of the top part of a Carvallo Cooker/Cooler showing feed elevator on the right or sprayed with water. The cans are then emptied from the crates and stacked up until required for labelling.

In small canneries, and indeed in some very large ones, the entire output of canned foods is held for up to two weeks, stacked in a warm room, to ensure that any cans which have been improperly sterilized, or which have sucked in bacteria during cooling, will blow before shipment, but in establishments where there is high-grade laboratory control, the cans are often inspected, labelled and cased right away and then shifted to the warehouse to await final clearance after a laboratory report upon the batch, based upon test cans.

In the general operation of retorting crates of cans, there is one risk which must be guarded against very carefully, either by close supervision or by check methods. This is the possibility of a crate of unsterilized cans slipping through into the finished can line, without even going into the retort. This can happen surprisingly easily and can cause a considerable loss. It is comparatively easy for an experienced canner to spot a crate of cans which has not been sterilized, because the cans do lose some of their shine during the process, but still it does happen. Some canners use a tell-tale check system whereby each crate has a small wax disc attached, which melts only when subjected to heat.

There is one matter which has not been mentioned in the course of the above discussion on retorting, and this is the question of cleaning the cans. These often get very dirty during the filling process, from spillage, and they must therefore be washed at some stage. This is sometimes done before retorting and sometimes afterwards, although there is no doubt that it is easier if done while the soup is still soft on the can and has not been baked on. There are a number of good can-washing machines made to couple on to the seamer or it is fairly easy to make a simple device for the smaller canner.

As an alternative, there is a process whereby the cans are actually sterilized under pressure in hot water instead of steam in the retort, and this water can be made to contain a detergent and so clean the cans.

RETORTING BOTTLED SOUPS

Where the soup is bottled instead of being put into cans, the same procedure is used, except that the retorting is somewhat more tricky in that the bottles break more easily. Retorts for bottling should be fitted with top water sprays instead of bottom inlets, as bottles must always be sprayed from above if cracking is to be minimized.

Soups generally fall into the so-called medium acid food group, with a pH value of between 4·5 and 5·0. Foods with pH values greater than 4·5 required fairly severe heat treatments as the lower limit of growth of *Clostridium botulinum* is at pH 4·5. Foods capable of sustaining the growth of this organism are processed on the assumption that the organism is present and must be destroyed.

The following are examples of processing conditions for canned soups:

CREAM OF TOMATO (pH 4·6–4·7)	
No. 1 Tall cans	75 minutes at 225° F.
OTHER SOUPS	
A 1 cans	75 minutes at 240° F.
No. 1 Tall cans	75 minutes at 240° F.
A 2 cans	100 minutes at 240° F.
A 2½ cans	120 minutes at 240° F.

A word should be said here concerning internal lacquers for cans, although many soups can be packed quite safely in plain cans.

When a soup contains a high protein content a small amount of the protein may be broken down during processing to produce sulphur compounds. Unless protective measures are introduced these compounds then react with the iron of the tinplate to produce black iron sulphide. Two types of lacquers have been produced to counteract this. One form has an oleoresinous lining containing finely divided zinc oxide which forms white zinc sulphide with sulphur products. The other type is made with phenol-formaldehyde compounds which are impermeable to sulphur products.

From a corrosion standpoint most soups are relatively non-reactive. As has been partly discussed above, corrosion depends on many factors, including: acidity, pH, trace amounts of copper and sulphur, pigments and air. Internal corrosion may be minimized by taking the following precautions:

1. Avoidance of over- or under-filling of soup.
2. Elimination of the air before closing.
3. Adequate cooling to, say, 95°–105° F., then air cooling.
4. Storage in a cool atmosphere after processing.

It should be noted that chemical corrosion reactions, in common with others, double their reaction rate with each 18° F. rise in temperature.

To eliminate or cut down external corrosion the following points should be observed:

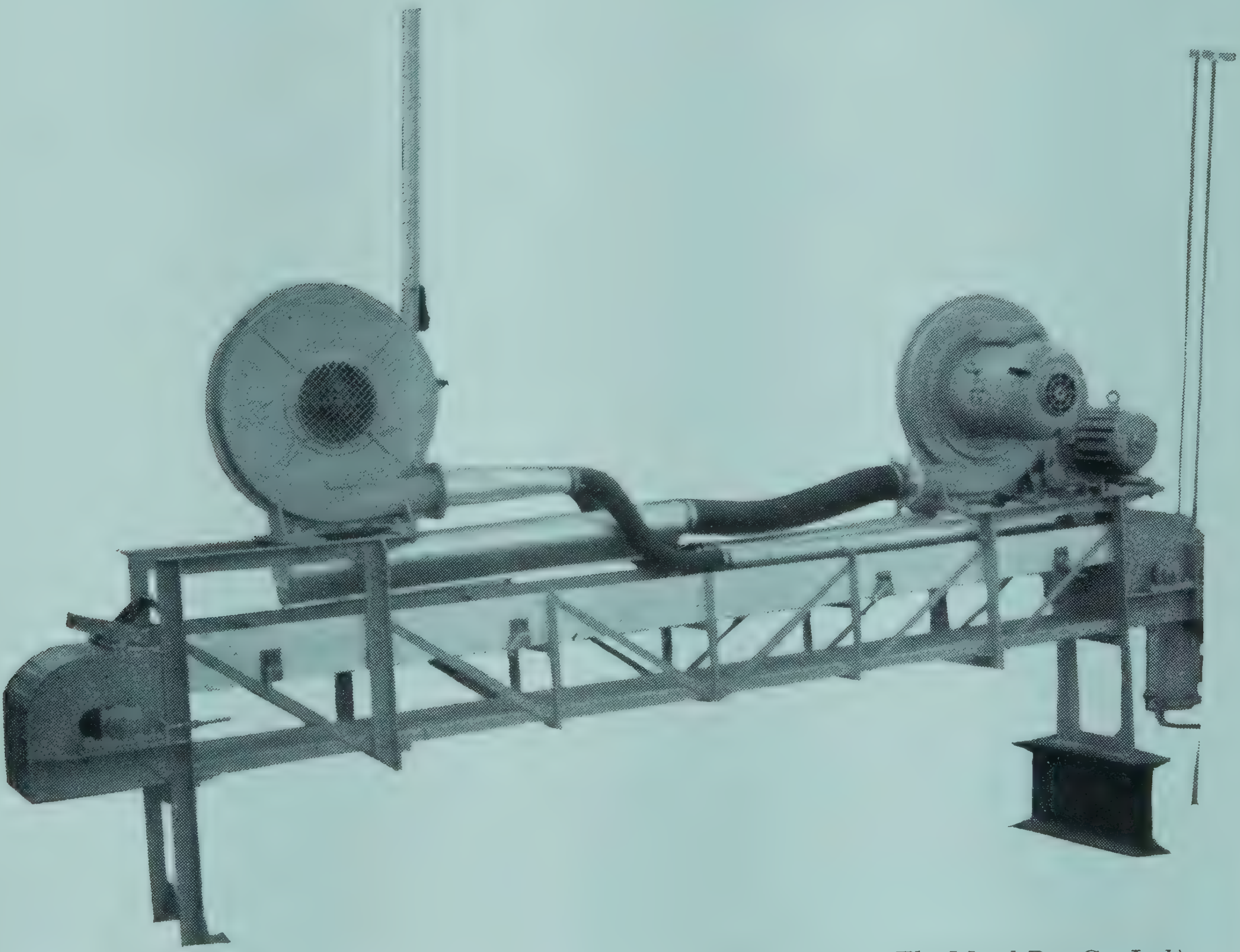
1. Dry storage of empty cans.
2. High temperature of exhausting or filling.
3. Prevention of injury to can surfaces.
4. Washing of cans after processing.
5. Avoidance of rust in retorts, trucks and crates.
6. Adequate air removal by venting in retorts.
7. Control of chemical composition of water used in processing.
8. Adequate cooling of cans.
9. Avoidance of casing of wet cans.
10. Selection of a non-hygroscopic paste for can labels.
11. Selection of a non-corrosive storage atmosphere.

A new type of canning process in use in the United States is the Martin aseptic canning method. This consists, basically, of sterilization of the food product prior to filling into sterile cans. The following steps are observed:

1. The product is sterilized in a heat exchanger using an HTST (high temperature—short time) process.
2. The cans and ends are sterilized in superheated steam.
3. The relatively cool sterile product is filled into the sterile cans.
4. Sterile ends are applied to the filled cans in an atmosphere of either saturated or superheated steam.

Another relatively new technique for certain food products is the rotation-agitation method. This may be continuous end-over-end, continuous axial rotation or intermittent axial rotation. The rate of heat penetration is increased by these methods. An example of mushroom soup may be quoted whereby a 603 × 700 (U.S.A. No. 10) can requires only 19 minutes at a process-agitated temperature of 260° F.

The heating time is reduced and higher temperatures may be used with less danger of over-cooking. Greater retention of certain nutrients is also an advantage and large cans, up to A 10 size, of viscous products may be processed successfully. Colour and texture are improved in certain foods also.



(By courtesy The Metal Box Co. Ltd.)

The MB Filled Can Dryer for use after processing to remove surplus moisture. May be inclined up to 60° to link with labeller or caser.

CHAPTER V

LEGAL ASPECTS

THE composition of canned soups is still governed by a Code of Practice (1947) agreed to by the former Ministry of Food and the trade. The Code does not have the force of law but as it has been adopted after consultations with the trade it is generally accepted by manufacturers. Codes of Practice tend to be accepted by the Bench in court cases and, in so doing, they then establish a standard as a precedent. Many of the items in the Code are now being considered by the Food Manufacturers' Federation as it felt that some are controversial and some ambiguous. The Code was drawn up when products for soup manufacturers were in short supply and the Code was never intended to represent normal practice in times of free supply although it has come to mean a standard for many manufacturers. It aims to preserve the recognized characteristics of canned soups sold under established names.

In the absence of any reference to dilution on the label, the soup in the container must conform to any minimum quantity prescribed in the specification. If the label bears a reference to dilution it must be specific and the relative minimum quantities must be increased proportionately in accordance with the dilution recommended. The following specification is from "The Advertising, Labelling & Composition of Food", H.M.S.O., 1949.

1. MEAT SOUPS

For the purpose of the definition of meat soups, meat means raw fat-free boneless edible flesh or the equivalent of dehydrated meat when reconstituted. Meat extract, hydrolysed protein or yeast extract are not equivalent to meat and may not be reckoned as such.

Where dehydrated meat is used it may be disclosed in the statement of ingredients without the prefix "dehydrated", and its position should be related to its reconstituted state.

If not more than 50 per cent of the minimum meat content consists of whalemeat the existing description may be retained. In the case of Oxtail Soup and Kidney Soup the proportion of whalemeat must not exceed 50 per cent of the meat content excluding offal; thus Oxtail Soup may contain 2 per cent oxtail and half of the remaining 4 per cent may be whalemeat. Where whalemeat is used it must be disclosed as such in the statement of ingredients.

(*a*) "*Meat Soup*"

A product sold under this description, unqualified, should contain not less than 6 per cent by weight of meat (excluding bone and fat).

(*b*) "*Meat Soup—made with an edible extract*"

As a temporary concession, a product which contains not less that 1·5 per cent by weight of meat (excluding bone and fat) and, in addition, an appropriate amount of edible extract, may be described as:

"Meat Soup—made with Meat Extract";
"Meat Soup—made with Hydrolysed Protein";
"Meat Soup—made with Yeast Extract";

as the case may be. Where more than one edible extract is used, the title should include the name of the predominating extract only.

(*c*) "*Oxtail Soup*"

This must contain not less than 2 per cent by weight of whole oxtail including bone. The total content, however, of any kind of meat (excluding bone and fat) must not be less than 6 per cent by weight.

(*d*) "*Oxtail Soup—made from Oxtail Extract*"

As a temporary concession, a product sold under this description if it contains not less than 1½ per cent by weight of meat (excluding bone and fat) and, in addition, an appropriate amount of oxtail extract.

(*e*) "*Turtle Soup*"

This should contain not less than 6 per cent by weight of turtle meat.

(*f*) "*Mock Turtle Soup*"

A soup sold under this description should contain not less than 6 per cent by weight of meat (excluding bone and fat).

(*g*) "*Kidney Soup*"

This soup should contain not less that 6 per cent by weight of meat (excluding bone and fat) of which not less than two-thirds shall be kidney meat.

(*h*) "*Mulligatawny Soup*"

A product sold under this description should have a meat content of a meat soup, i.e. not less that 6 per cent by weight of meat (excluding bone and fat). It should be flavoured with curry and may be garnished with an appropriate cereal.

2. CREAM SOUPS

In a Ministry of Food circular MF 3/54 dated 8th February, 1954, the following standards were established:

A cream soup must contain not less than 2½ per cent by weight of butterfat; *or* if the butterfat content is between 1½ per cent and 2½ per cent by weight then the total fat content should be not less than 3 per cent by weight; *or* if the butterfat content is between zero and 1½ per cent by weight then the total fat content should be not less than 3½ per cent by weight.

3. VEGETABLE SOUPS

For the purpose of the definitions of vegetable soups, the term "bulk weight" shall denote the weight of the fresh vegetable when prepared for use, i.e. peeled, trimmed or shelled, as the case may be.

(*a*) "*Vegetable Soup*"

A product sold under this, or similar, description, e.g. "Mixed Vegetable Soup", "Windsor Vegetable Soup", should contain at least four different varieties of vegetable and no one variety should unduly predominate. If the weight of one vegetable is more than the total weight of the other vegetables, the description of the soup should include the name of the predominant variety (e.g. Potato and Vegetable Soup).

(*b*) *Single-named Vegetable Soups, e.g. "Celery Soup", "Tomato Soup", "Lentil Soup"*

In this type of soup the bulk weight of the named vegetable must exceed the sum of the bulk weight of remaining vegetables (if any).

(*c*) *"Pea Soup" and "Green Pea Soup"*
The description "Green Pea Soup" implies a soup made from fresh green peas or from canned or frozen green peas. A soup made from processed or dried marrowfats and blues must be described as Pea Soup without any suggestion that fresh green peas have been used.

4. Clear Soups

For the purpose of the following definition, a clear soup is considered to be the thin clear liquid obtained by the suitable extraction of meat, or by the dilution of an appropriate amount of meat extract, or, in the case of vegetable clear soups, by the suitable extraction of selected vegetables.

(*a*) *Single-named Meat Consommés, e.g. "Chicken Consommé"*
This type of soup should be a clear one in the preparation of which the named meat, e.g. Chicken, has been the predominant single ingredient.

(*b*) *"Consommé"*
A product sold under this description should be a clear soup in the preparation of which meat (or an equivalent amount of meat extract) has been the predominant single ingredient.

(*c*) *"Julienne"*
A soup sold under this description should be a suitably flavoured clear soup, in the preparation of which meat (or an equivalent amount of meat extract) has been the predominant single ingredient. It may contain not less than 3 per cent and not more than 6 per cent by weight of strip or diced vegetables.

(*d*) *"Clear Vegetable Soup"*
A clear vegetable soup may not be termed "Consommé" or "Julienne" and the word "Vegetable" must appear in the title.

5. Broths

A broth as canned shall contain meat or bone extractives, derived from meat, bones, meat extract or bone extract, used either singly or in any combination of two or more, in such proportion that the "meat nitrogen" content shall be equivalent to not less than 1 per cent by weight of "protein"

(N × 6·25). The broth may contain, optionally, meat fibre, vegetables, farinaceous material, spices, herbs and suitable colourings and flavourings.

(*a*) *Single-named Meat Broths, e.g. "Beef Broth"*
A soup sold as "Beef Broth" should be a broth as defined above in the preparation of which only beef, beef extract or beef bones have been used as the meat ingredient. In the case of "Chicken Broth", however, 75 per cent only need be in the form of chicken protein, the remaining 25 per cent to be derived from other meats.

(*b*) "*Mulligatawny Broth*"
A product sold under this description should be a broth as defined above flavoured with curry, and may be garnished with an appropriate cereal.

(*c*) *Single-named Vegetable Broths, e.g. "Tomato Broth"*
A product sold as "Tomato Broth" should be a broth as defined above and should contain at least 20 per cent of tomatoes.

N.B.—The figures for the meat nitrogen content, which is given in the definition of broth, relates not merely to the liquid part but to the complete product including solids. Thus the meat protein content of a 16-oz. can of broth, of which 12 oz. is liquid and 4 oz. solid, should be 1 per cent of 16 oz.

6. MISCELLANEOUS

(*a*) "*Brown Soup*", "*Windsor Soup*", "*Eton Soup*"
Soups sold under these descriptions should be thick brown soups, the basis of which is a brown roux to which a broth as defined in paragraph 5 above has been added.

(*b*) "*Minestrone*"
A product sold under this description should contain appreciable amounts of strip or diced assorted vegetables, and may or may not contain meat. A macaroni product (macaroni, spaghetti, vermicelli) must be present.

(*c*) "*Scotch Broth*"
A soup sold under this description should contain not less than 6 per cent of meat (including bone and fat),

or 3 per cent of boned meat. The predominating proportion in both cases should be mutton. It should contain barley and an assortment of vegetables and should be thickened to a suitable consistency.

(*d*) "*Mushroom Soup*"

A soup sold under this description should contain mushroom as the predominant single ingredient.

All canned and bottled soups require to have the ingredients declared on the label in descending order of magnitude by weight. Artificial preservatives are forbidden but artificial colourings are permitted so long as they are on the permitted list. A statement of the net weight of the can or other container contents should also appear on the label. The name and address of the soup manufacturer are also necessary unless a registered trade name is used. Manufacturers should be particularly careful not to make unjustifiable dietary or medicinal claims for their products.

An interesting case involving soup mixes was reported in 1959 (Brit. Fd. J., *61*, 69, 1959). A company was summonsed on the ground that their mushroom soup mix did not contain dried mushrooms and that the ingredient, the fungus *Boletus edulis*, was falsely described on the label. The defence was that the company used *B. edulis* because the dried English mushrooms are dark in colour and do not have the real mushroom flavour and hence are unsuitable for soup mixes. The magistrates decided that *B. edulis* is properly described as a mushroom and any firm using this was putting mushrooms into their soup mixes. The case was dismissed with costs for the defendant and it was stated that three other soup mix manufacturers were also using *B. edulis* in their soup mixes.

CHAPTER VI

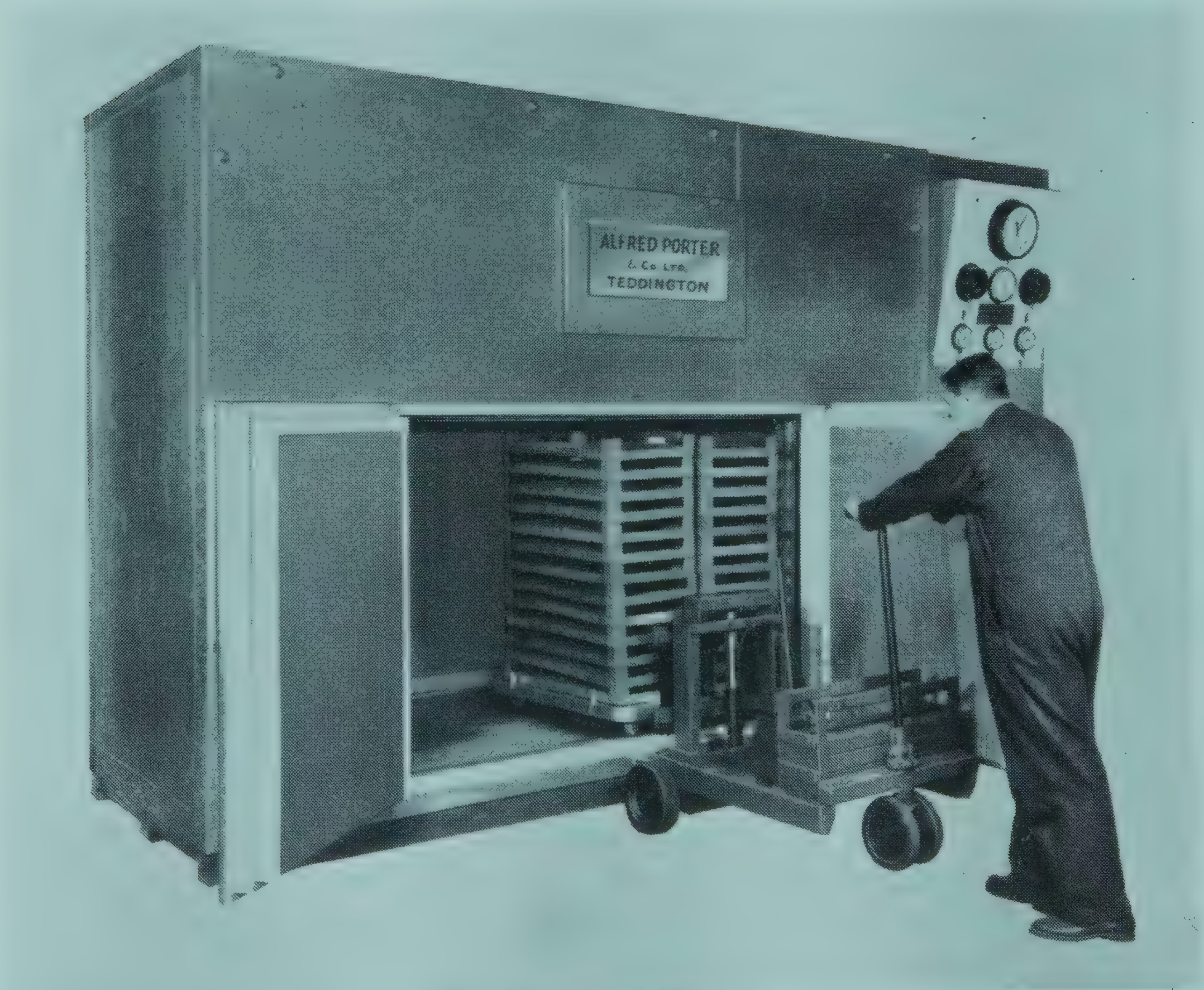
QUICK-FROZEN SOUPS

QUICK-FREEZING is the newest of the methods of soup preservation described in this book and also the least used. Indeed, at the present time there are few quick-frozen soups on the market, although they are available. There is no doubt, however, that by quick-freezing it is possible to preserve soups of much better quality than by either canning or drying.

Canned soups suffer from the disadvantage that they have to be heated to a high temperature for quite a long time in the can in order to sterilize them and this means that they may easily be overcooked. Dried soups have of course to be dried and this does alter them considerably and they do not always reconstitute as they might. In addition, dried soups cannot easily be made to contain certain types of solid garnish, such as for example a piece of oxtail. On the other hand frozen soups can be made to contain anything required and as they are preserved by freezing they need not be overcooked or overspiced but can be preserved just in the condition in which they leave the kitchen.

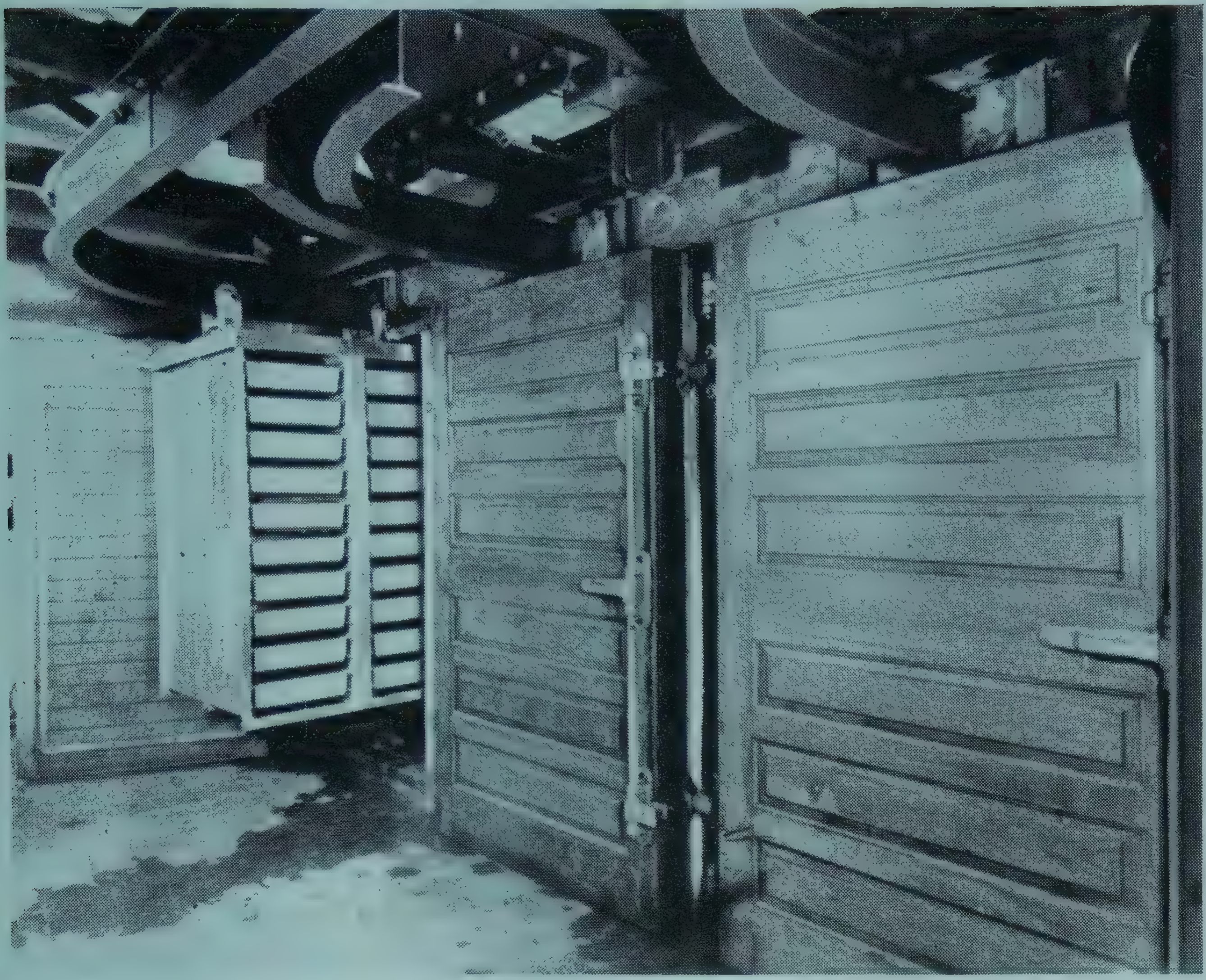
There is no doubt that the cost of preserving soup by freezing and then keeping it cold through all stages of distribution, is slightly greater than that involved in canning or drying, but with the growth of distributive facilities for frozen foods the gap is narrowing rapidly. Indeed, it is safe to say, that when the frozen food industry has grown a little more and turnover is greater and distributive profit margins smaller, there will be nothing in it as regards price between canned or frozen soups. Probably the greatest disadvantage of frozen soup is that it cannot be put on the larder shelf and kept like canned soup, and soup is essentially something which the housewife likes to keep in stock. Nevertheless there is and will be a growing demand for this kind of product, especially in the higher class type of soup, as if the housewife is buying other frozen foods for a meal, she will not mind buying her soup in the same way at the same time.

Perhaps at this stage it should be pointed out that foods which are preserved by quick-freezing, pass through the following stages. Firstly the foods are cooked or otherwise prepared, and they are then cooled and packaged. The degree of cooling will depend upon the product, the method of packaging and the method of freezing. The packaged foods are then frozen in a special machine and placed into cold store at zero F. or less. During transport from cold store to shop the foods must be kept frozen at zero by refrigeration or dry ice, and again the foods must be held at zero in the retail shop conservator until they are sold. When once purchased by the housewife, these foods must in general be used before they are completely thawed and warmed to room temperature. The various steps in production and distribution will be dealt with in detail



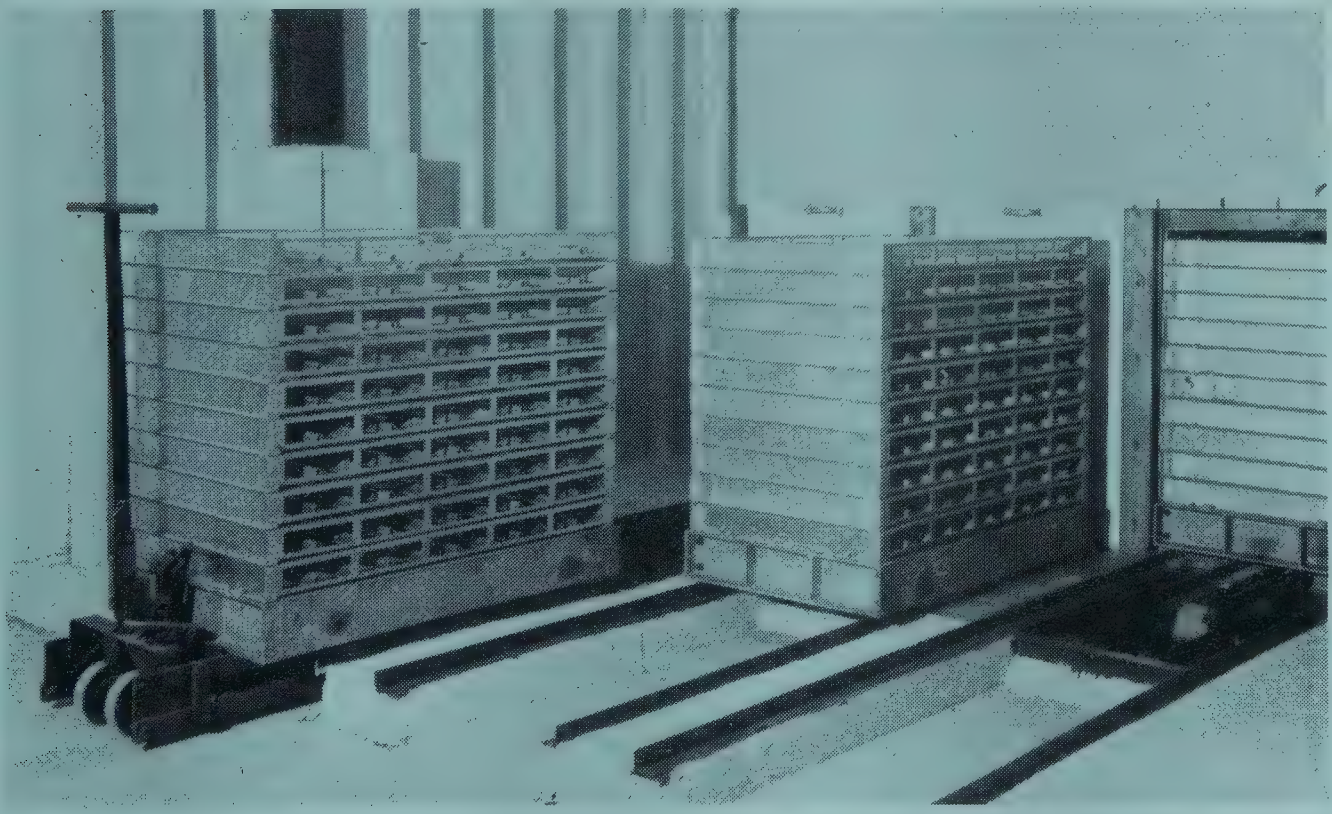
(*By courtesy Alfred Porter & Co. Ltd.*)

Self-contained blast freezer unit. This unit is charged with trucks from side doors and has cross blast, the direction of which is changed from time to time on an automatically controlled cycle.



(*By courtesy J. & E. Hall Ltd.*)

Three tunnel blast freezer installation, using overhead rails to carry freezer racks.



(*By courtesy L. Sterne & Co. Ltd.*)

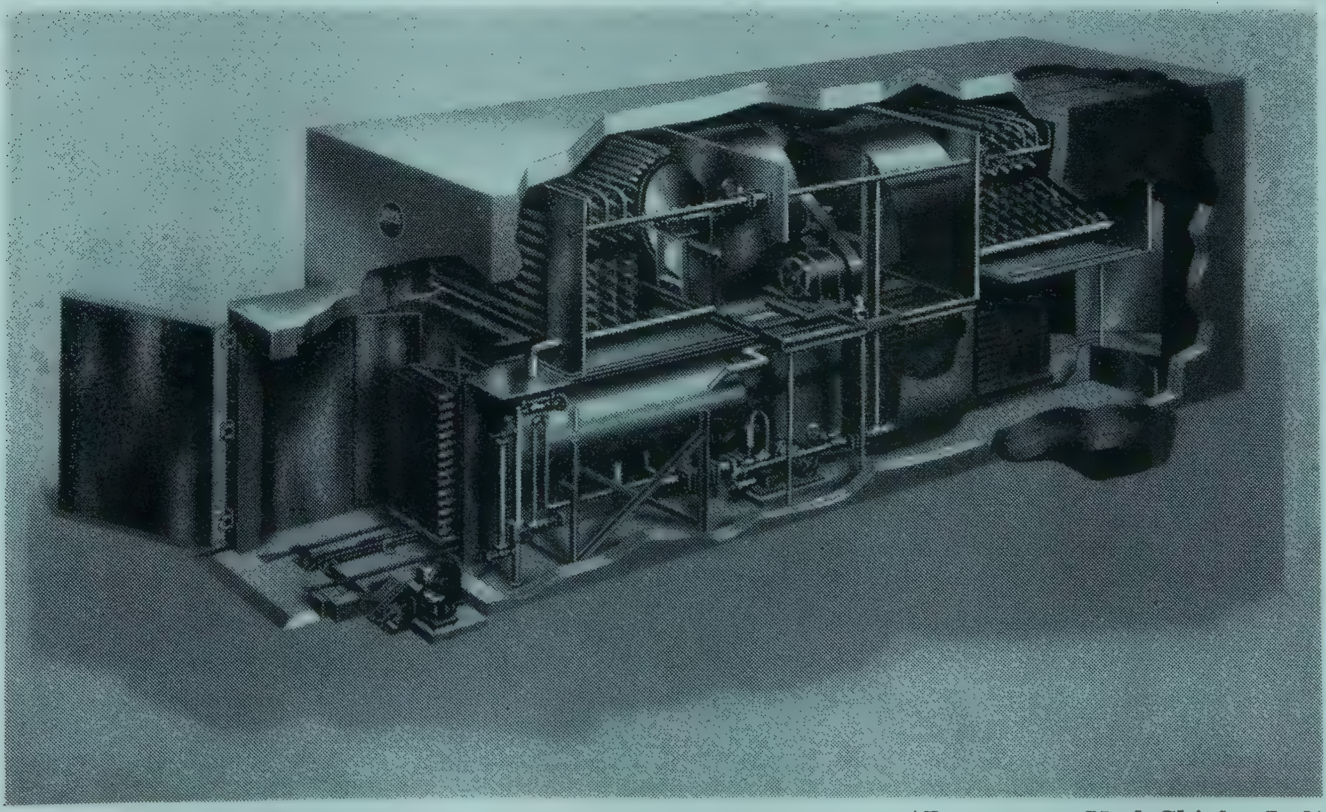
Three tunnel blast freezer installation. Racked materials are placed on to tunnel conveyor rails by special hand truck.

later, but the necessity for refrigeration at all stages must be clearly understood from the start.

Undoubtedly comparatively low priced, savoury types of soup, such as are used for canning, could be produced and preserved by freezing and may be in the future. For the moment, however, because quick-freezing is different and to some extent a luxury trade, the tendency is to produce higher class soups or other foods, of a type which cannot readily be canned or dried. Thus for example, real cream soups, which cannot be canned, lend themselves to quick-freezing.

If frozen soups were to be produced on a very large scale as in a modern cannery, then the same equipment and to some extent the same production technique would be applied. However, as has been stated, this new preservation method is being applied mainly to higher class soups and in most cases therefore something more on the lines of a very large hotel kitchen is called for.

In general, the soup to be frozen is made exactly the same as it would be for immediate consumption in an hotel, although certain allowances have to be made for changes which are likely to take place during storage in the frozen state and



(*By courtesy York Shipley Ltd.*)

Truck-type blast freezing tunnel, with insulated walls cut away to show arrangement of coils and fans, etc., to give lengthwise air circulation.

during heating up. Some of the changes which are likely to take place, and the methods which must be applied to counteract them, are as follows:

1. Soups tend to become slightly "flat" during storage and the sharpness should therefore be increased at the time of manufacture to allow for this.

2. Most soups tend to taste less salt when stored for some time than they do when tasted fresh. This is because the salt becomes more evenly spread throughout the mixture during storage and extra salt should therefore be added.

3. Pepper increases in flavour and should be added sparingly.

4. Celery gets very much stronger and only delicately flavoured celery should be used. Coarse old stalks tend to give the product a strong odour and flavour.

5. Curry tends to develop a musty flavour in long-term storage, but if the time is reasonably short and a good fresh mix is used this will not happen, in fact curried foods do improve owing to the gradual permeation of the flavour through the mass of the dish.

Most soups and especially those containing a lot of fat tend to separate during defrosting. This does not matter as the soup will mix again during heating, but the following steps may be taken to overcome the trouble, which may affect sales:

1. It has been observed that it is better to use a smaller percentage of real cream in a mix, plus water, rather than all milk.

2. Whole egg or egg yolk added to a soup acts as a valuable stabilizer, but egg yolk is better than whole egg. Never use egg white alone as this will tend to toughen the product during storage. When egg yolk alone is used, never heat to more than 160° F., or if whites are included, to not more than 145° F.

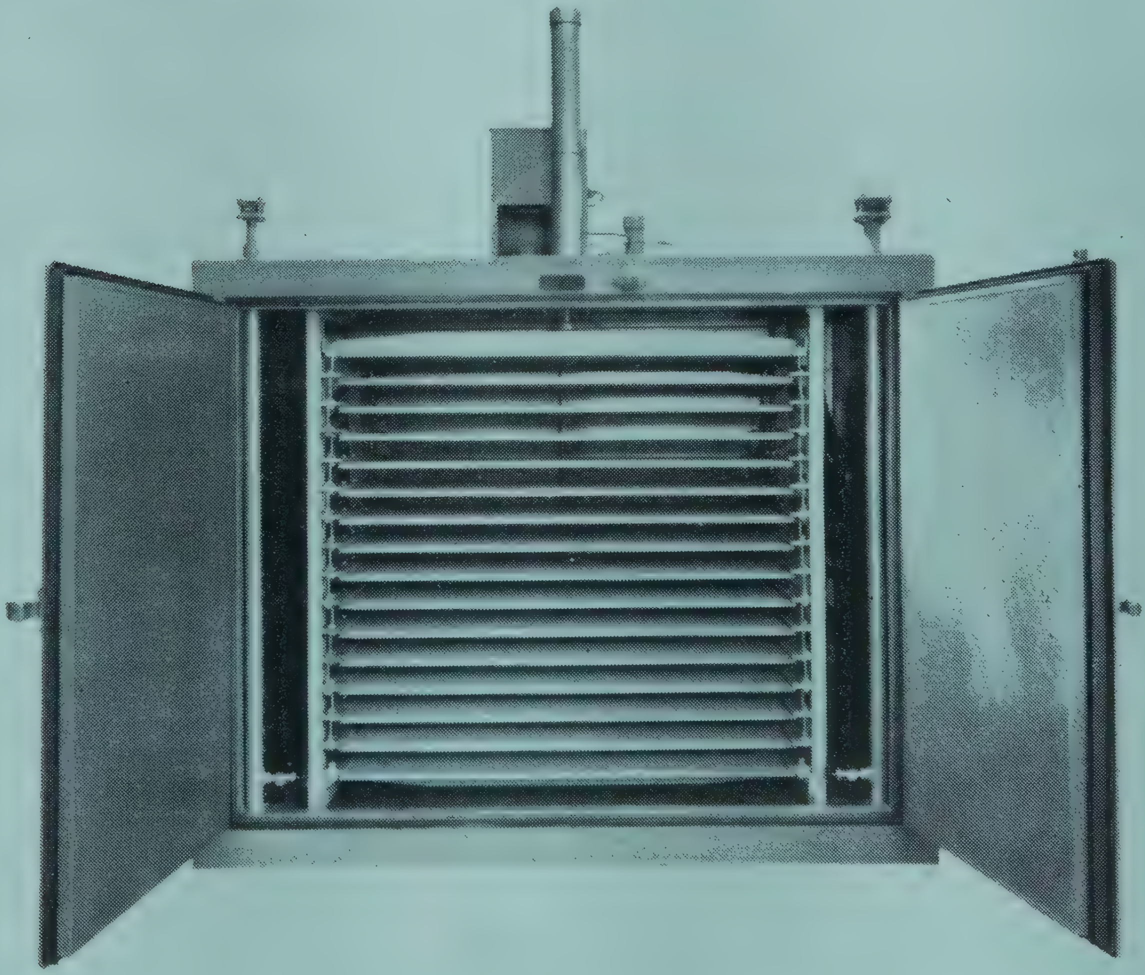
3. Such stabilizers and emulsifying agents as glyceryl monosterate are most useful, and the common ice-cream stabilizers can be used with benefit.

4. Wherever possible, it is most desirable to emulsify soups before freezing.

Where starchy vegetables such as potatoes are added to soup, which is perhaps unlikely, or more particularly if extruded dough products like macaroni are used for garnish, then great care must be taken not to heat these too much before adding to the soup and freezing. Never cook dough products or starchy vegetables at a temperature higher than 145° F. or they will soften and disintegrate during storage.

Where root vegetables such as carrot are used for garnish, these are best if they are parted from the liquid element of the soup before the liquid is cooled and then added back to the cooled liquid for freezing whilst they are still hot. The hotter the vegetables are when frozen, and the lower the freezing temperature used, the more "crisp" will be the vegetables when finally heated and served.

Where sugar is a part of the recipe, it is as well to add 10 per cent of this sugar content in the form of a reducing sugar, as oxidation is one of the worst enemies of frozen foods. For this reason also, it is most desirable to remove as much



(By courtesy G. Williams Engineering Co. Ltd.)

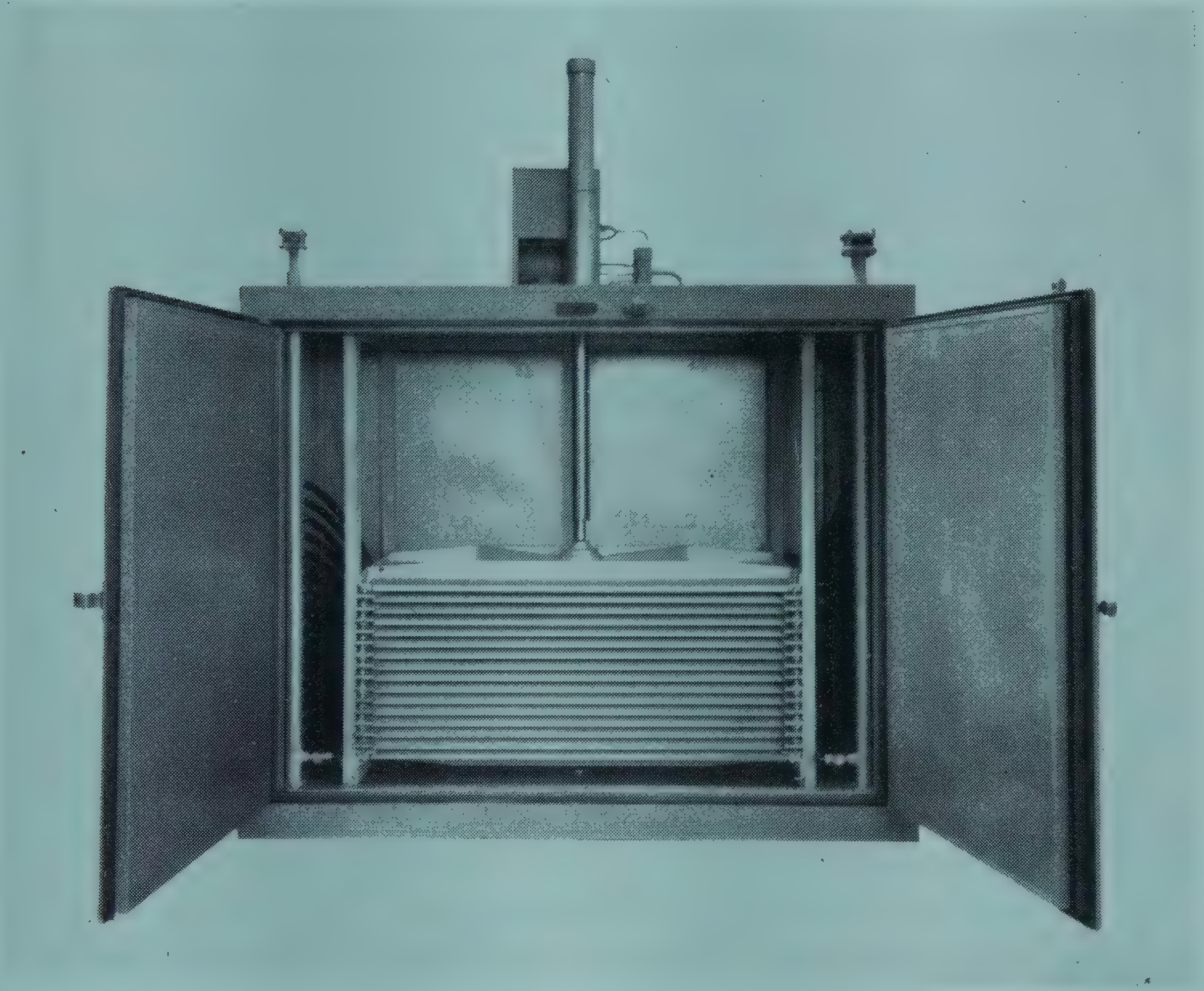
Double-contact plate freezer, with plates in "open" position, ready to receive trays of packages.

air from the soup as is possible. To a certain extent the actual cooking of the soup will drive off the air, but where reasonably large-scale operations are undertaken, it does undoubtedly pay to use a deaerator. Care must also be taken to drive as much air as possible out of the package used.

The actual steps involved in making frozen soups and the plant required are as follows:

1. The usual stock-making and other kitchen equipment with which high-class soup is made in the ordinary way. The soups should be cooked to a degree just right for serving and no allowance is made for the cooking which will take place during reheating and there is of course no cooking in the container, as in canning so that vegetables, etc., must be properly cooked.

2. Where large-scale operations are in progress and the cost is justified, the hot liquid soup should definitely be deaerated at this stage. Deaeration is carried out in a special



(By courtesy G. Williams Engineering Co. Ltd.)

Double-contact plate freezer, with plates in closed position.

piece of equipment which consists of a vertical cylinder in which a very high vacuum is maintained by a steam jet vacuum pump. The hot soup is fed into the top of this cylinder and flows down through it over a series of baffle plates which spread the liquid very thinly. The thin layer of soup is thus subjected to high vacuum flashes and gives up much of its occluded oxygen. The initial and final temperatures of the liquid have to be very carefully adjusted to prevent too much loss of moisture, and the whole piece of equipment is both elaborate and costly.

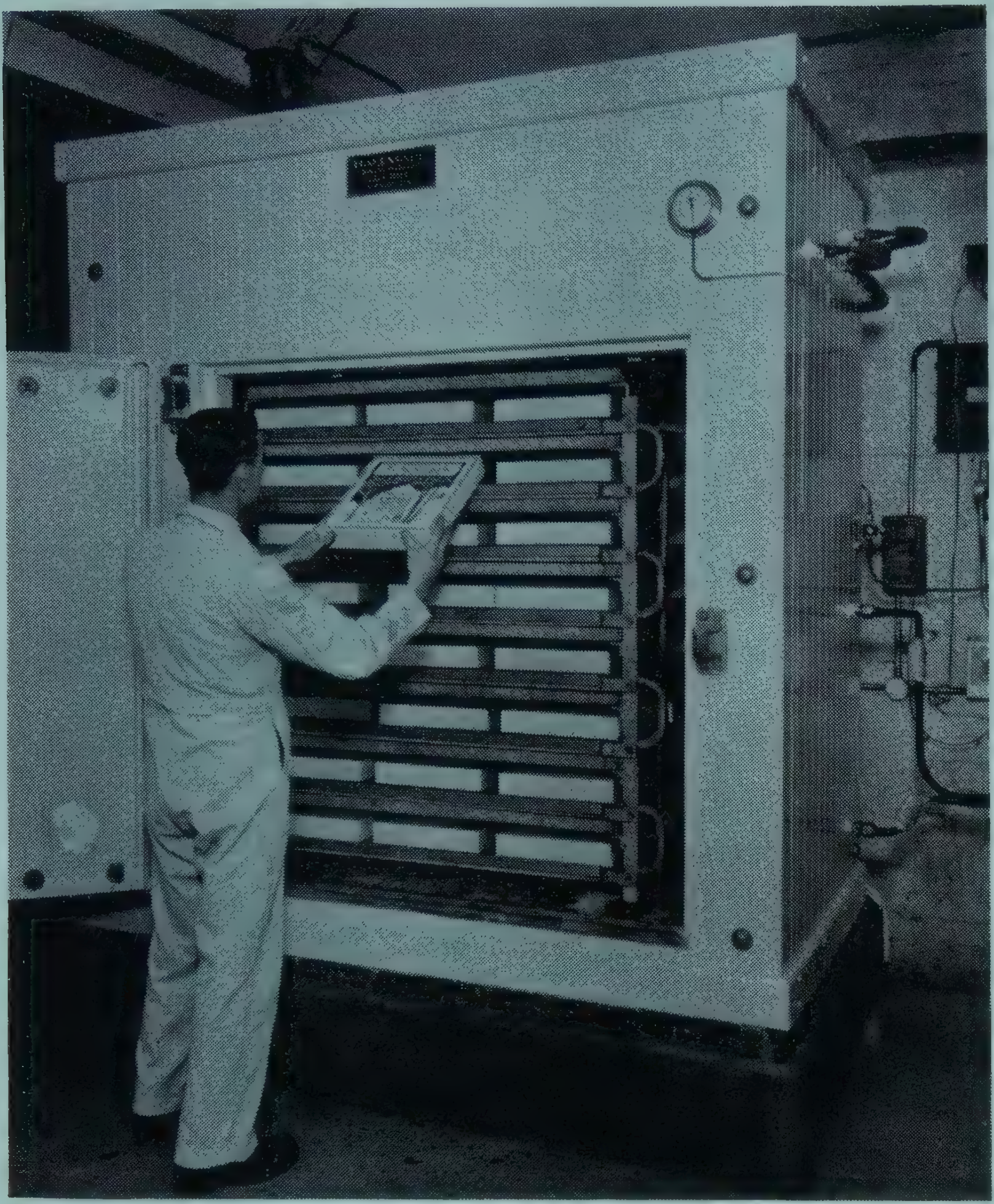
3. The liquid element of the soup should then be cooled, although where a type of package is being used which permits hot filling this step may be omitted and the cooling done in the freezer, although this is rather costly. The best method of cooling is to use an ice-cream type cooler, which must, however, be totally enclosed and preferably of the plate type. The cooling plates or grids must not be too cold, as the soup is usually thicker than ice cream and may therefore clog up. For this reason a brine type cooler is better than direct expansion types. For very thick soups, water cooling is adequate, unless a drum-type cooler with a scraper is available.

4. After cooling, the liquid and the solids, if any, are filled into packages, either by hand or on a machine.

Packages vary a great deal, but the best type is that which lends itself best to ultimate reheating. The cheapest form of package is of course a simple film or waxed paper bag and this is perfectly satisfactory so long as the housewife removes the block of soup while it is still frozen. If, however, she allows the soup to become partially or wholely defrosted, then the soup does tend to stick to the bag. Waxed or plastic-coated boxes are quite good for this purpose, but only the plastic-coated type can be filled hot and neither type lends itself to the application of heat for thawing and warming up. Undoubtedly the best container for frozen soup is an aluminium foil bag or rigid box, and not only can the soup be filled in hot, but at the same time the soup may be thawed and heated in the bag or box, thus simplifying the whole procedure in the kitchen and making the emptying of the container easier.

Whatever type of container is used, it should be filled carefully and sealed so that it is both airtight and moisture-vapour-proof. In most cases a heat seal is best. Whilst some headspace must be left to allow of expansion during freezing, this space should not be too great, as this means more air entrapped in the bag. Vacuum sealing would of course be ideal.

As an alternative to freezing in the container, the soup may be frozen in blocks in suitable moulds, and then put into the package afterwards. Where film bags are used, this system has the merit that it standardizes the size and shape of the pack.



(*By courtesy J. & E. Hall Ltd.*)

Self-contained combined plate and blast freezing unit with door open to show freezing shelves.

5. The actual freezing process may be carried out in any one of a variety of machines made for the purpose, but in general there are three possible methods of quick-freezing: by immersion of the goods in a low temperature freezing medium; by contact with a very cold surface; or by subjection of the food to a very cold air blast.

Immersion freezing is not really suitable for soup freezing, so that there is a choice of contact or blast freezing.

The contact freezer, giving both top and bottom contact, is a machine in which there are a series of large flat shelves placed one above the other in a suitably insulated cabinet. These shelves are cooled by direct expansion of a refrigerating gas and are mounted on guides so that they may be moved up or down to close or open the gaps between the shelves. In operation the packages of food to be frozen are placed on the shelves, either singly or on trays, the shelves are then closed together so that contact is achieved with both the top and bottom of each package. In these machines a slight pressure is applied to the packages. Heat is then extracted from the packages and the foods frozen by means of the top and bottom contact of the packages with the cold shelves or plates, as they are usually called.

One of the great advantages of these machines is that by reason of the slight pressure which is applied to the packages, these are kept in good shape and do not curve or bulge during freezing. This in turn simplifies packing the frozen units into shipping cases. However, as will be readily realized, the necessity for both top and bottom contact over the entire area of the package means that only rectangular packages may be used and these may not have lid or bottom end recesses. These machines may of course be used for soups in film bags, if these bags are held in shape in formers of the right dimensions to allow the bag to expand outwards under pressure to the right degree, but they do not allow of the use of round pots with lid and bottom recesses nor of the freezing of sundry lines of odd shape, outside the soup range.

In view of the fact that any manufacturer who makes quick-frozen soups is also likely to use the plant for freezing other pre-cooked food lines, some of which may not be of very regular shape, it seems possible that in most cases a blast freezer, or one which combines blast and contact will be the most suitable.

Blast freezers are made in many different forms by various manufacturers, but essentially a blast freezer consists of two large insulated boxes, or rather one box divided into two sections. In one section is the space for the foods to be frozen, either on shelves or on trolleys as the case may be. In the second section are cooling coils of a suitable size to deal with one load of food. Air is circulated over the coiling coils, over the food and back to the coils again, by means of a fan and thus the heat from the food is carried by the air to the coils and eventually by way of the compressor down the drain or into the atmosphere by way of the condenser water.

In some cases, contact as well as blast is used, by means of using cooled shelves on which to place the goods. In this case, however, there is no top contact, but only a cold blast passing over the top of the goods.

Whilst this description may make the blast freezer sound a very simple piece of apparatus, it is in fact most complicated in design, as the size of the cooling coils, the rate of air flow, the expansion temperatures and so on, have to be most carefully balanced to give the best effect and to avoid drying out the foods being frozen or excessive frost formation on the coils. There are a number of small blast units made in this country which are highly suitable for new, small-scale operations and a number of these machines are already being used for various types of pre-cooked foods.

6. Proper storage and transportation of frozen foods and especially pre-cooked frozen foods is essential. The foods must be stored at all times at zero or preferably below and, above all else, the temperature must not be allowed to vary. Variations in temperature, by even a degree or two, will lead to the drying out of the foods and serious loss of flavour.

In general, it must be said that the processing and handling of any type of pre-cooked frozen food is a most delicate operation, certainly much more delicate than the handling of ordinary frozen fruits or vegetables. Once food is cooked, it develops all its volatile flavours to the full, and unless the food is handled carefully and quickly at all stages prior to freezing, and is then stored properly, at low and even temperatures, these precious and all-important flavours will be lost.

CHAPTER VII

DRY SOUP MIXES

DRY soup mixes are now a popular item on the British food market and a large turnover is being achieved by the manufacturers of this product in the United Kingdom. The number of varieties of soup mixes is almost as great as for canned soups and the number of packets sold is about 100 million per year. These mixes are relatively more popular in traditional soup-conscious areas but they are increasing in popularity at a rapid rate in the rest of Great Britain. This type of food item has a very low unit volume and a relatively long storage life and hence is also useful for institutional and catering packs and as an integral part of rations for the armed forces and for "disaster feeding".

The type of dried soup mix to be discussed here is the one commonly sold in the familiar foil envelope. However, blocks of soup mixes manufactured by compression are also available in the form of "chocolate" blocks, so-called since portions can be broken off as desired for reconstitution into liquid soup.

These soup blocks were developed in the Scandinavian countries and are formed on chocolate moulding and packaging machines. Normally they contain a very high percentage of fat to give them good compression qualities.

Soup powder blocks and soup powders will not be considered here since these are normally composed wholly of powdered materials so that they reconstitute with very little boiling and they are made to satisfy a different market to that served by the soup mix which contains, normally, discrete pieces of meat and vegetables.

Dry soup mixes can be correctly considered as specialized composite dehydrated food items as they are compounded mainly of dehydrated foodstuffs and require only a short period of reconstitution with hot or boiling water before consumption. Soups, as made domestically, require a great deal of preparatory work and the handy soup mix thus saves the consumer a lot of time. It would be interesting to learn whether soup mixes have captured part of the canned soup market or whether they have created a market of their own, since housewives have the satisfaction of doing part of the "cooking" of the soup themselves. It may well be that people with little time to prepare their own traditional soups have turned in part to the use of soup mixes, which compare very favourably in price and quality with the canned variety.

It should be emphasized that soup mixes, to be really popular consumer products, should be manufactured from good quality raw materials and that expert and consumer testing panels should be used in conjunction with research on the storage properties to ensure that first-class products are made. Sound publicity is of course essential for large-volume sales and expert development work on product evaluation should precede each new soup mix before marketing.

The following is a list of soup mixes which are available, mainly in the United Kingdom and the Continent of Europe:

Cream of Asparagus
Cream of Chicken
Cream of Mushroom
Cream of Tomato

Crayfish Bisque
Fish Chowder
Lobster Bisque

Beef Noodle
Chicken
Chicken Noodle
Chicken Vegetable
Chicken with Rice
Cock-a-Leekie
Egg Scramble
Kidney
Noodle with Meat Balls and Vegetables
Oxtail
Scotch Broth

Asparagus
Cauliflower
Celery
French Canadian Pea
French Onion
Goulash
Leek with Ham
Minestrone
Mushroom
Onion
Onion with Cheese
Pea
Pea with Bacon
Pea with Ham
Potato
Potato with Bacon
Spinach
Tomato
Tomato Vegetable
Vegetable—Clear
Vegetable—Thick

CHICKEN
SOUP WITH RICE
MAKES 4 SERVINGS

This Norwegian pack is similar to a bar of chocolate and is moulded and compressed to produce eight individual squares, which may be used independently. The tablets are wrapped in laminated aluminium foil and are then banded with an attractive slide wrapper printed in three colours.

RAW MATERIAL EVALUATION

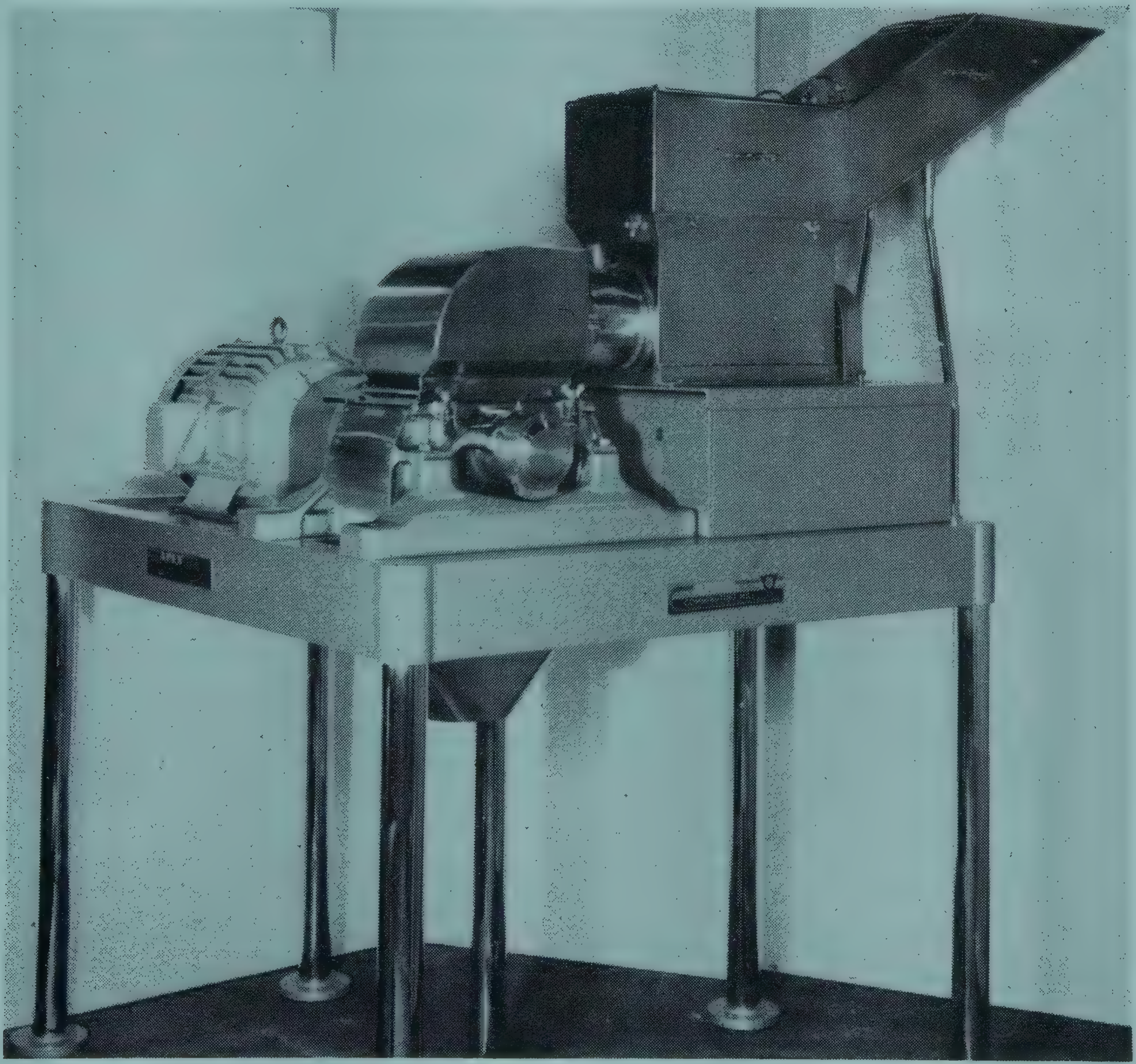
The many ingredients of soup mixes may be conveniently listed in the following main divisions:

1. Dehydrated meat and fish ingredients.
2. Dehydrated vegetables.
3. Farinaceous products and thickeners.
4. Salt, flavourings and extracts.
5. Herbs and spices.
6. Colourings, acids and alkalis.
7. Fats.
8. Protein products.
9. Sugars.
10. Milk products.

1. Dehydrated Meat Ingredients

Dehydrated chicken and beef are examples of this division, being used in chicken noodle and in mulligatawny mixes, respectively. Dried oxtails and kidneys are used in their respective soups and practically any type of meat, game and poultry can be dehydrated for speciality mixes.

Various methods of dehydration are available although the smaller manufacturer usually purchases dehydrated meat products from firms specializing in their preparation. Prepared chicken for mixes is often a useful adjunct to the chicken processor who can convert scraps of chicken into paste form by utilizing the fat to produce a necessary article for the chicken noodle type of mix. Pieces of chicken and beef can be dehydrated in small pieces or as a mince in conventional oven dryers or, preferably, in the new vacuum contact processing



(*By courtesy Apex Construction Ltd.*)

The Apex Mill No. 170 for comminuting dried vegetables for soup mixes.

equipment.[1] Meat ingredients should be of fairly low moisture content, i.e. not more than 5 per cent moisture. They should be free from extraneous matter and able to withstand at least one year's storage at 70° F. without undergoing any undesirable changes.

2. Dehydrated Vegetables

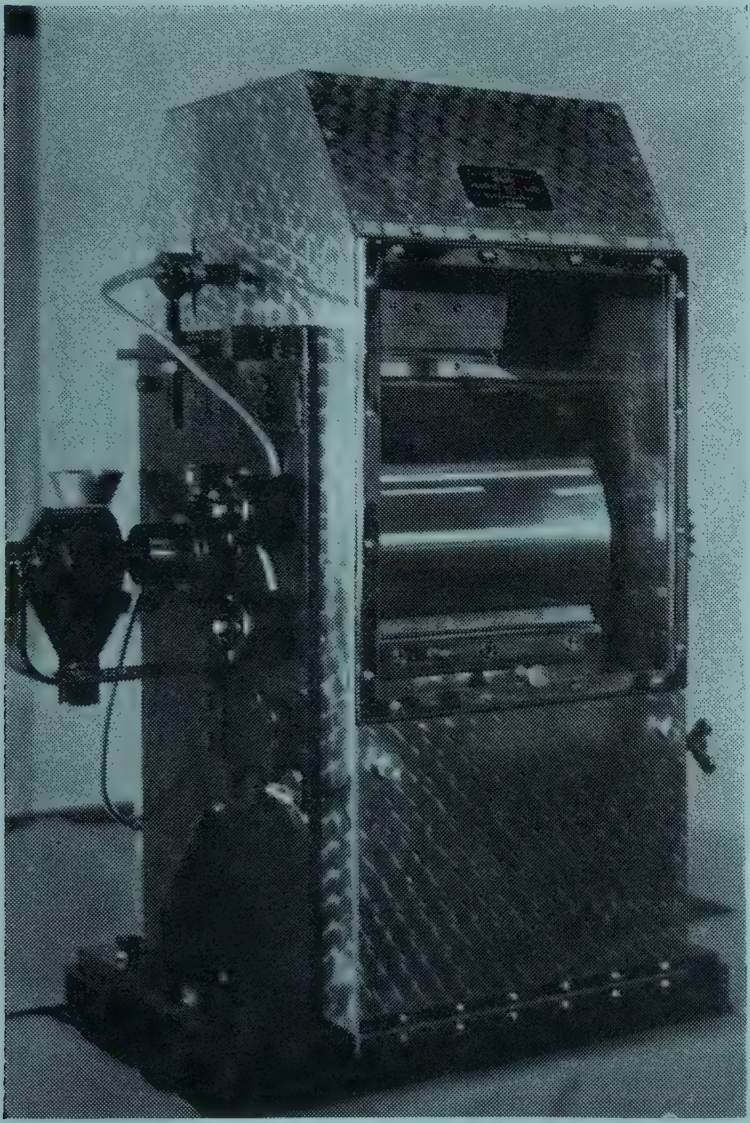
Very many types of vegetables are used in dehydrated form for soup mixes and the following are all available and are used at the present time: asparagus, beans, cabbage, cauliflower, celeriac, celery, leek, mushrooms, onions, parsnips, peas, peppers, potatoes, shallots, spinach, tomatoes, turnips, watercress.

They may be obtained in different forms such as dice, powder, strip, kibbled and purée, although the latter form is usually reserved for tomatoes, which are the raw material of the tomato ingredient on drying. Tray drying is often used for preparing these vegetables in a form suitable for inclusion in soup mixes although vacuum methods yield superior products.[2] It must be noted that a low moisture content is essential, preferably of the order of 5 per cent. This figure is subject to variation since each dehydrated material has its own equilibrium moisture characteristic and moisture may be absorbed or given up by the other ingredients in the mix.

The approximate moisture content may be determined by drying a ground weighed sample in an air oven at a temperature of 100° C. for 3 hours or by drying *in vacuo* at 70° C. for 15 hours. For reliable results the above methods should be related to absolute moisture content determined by drying samples over a powerful desiccant such as phosphorus pentoxide at room temperature, or by freeze-drying (lyophilization). The methods of entrainment distillation and the Karl Fischer technique[3] are very useful in certain circumstances. The former method employs the distillation of the sample in toluene while the latter utilizes a special reagent which reacts with water and which determines the end-point potentiometrically in a special apparatus.

Since quality is all important, dehydrated vegetables require to be examined for defective pieces. A sample, say 100 g., is taken, and the pieces defective by reason of blemishes, rots, flaws and insect damage, are separated and expressed as a percentage by weight. A limit of 1–2 per cent defective pieces, dependent on the product, may constitute rejection of a particular lot of dehydrated vegetables.

Testing for the presence or absence of enzymes should be carried out on all vegetables except onions, since the latter are not blanched before dehydration. Enzymes, therefore, are always present in onions after dehydration and the finished product has a good storage life. Enzymes may be considered as biochemical catalysts, essential to all life, and they are present in all living plant tissue. If blanching prior to dehydration is inadequate these enzymes are not inactivated and hence they may catalyse chemical reactions in the dried vegetables on storage, and in the soup mix, and thereby give rise to off-flavours and off-odours. Testing for the presence of peroxidase and catalase is carried out as follows:



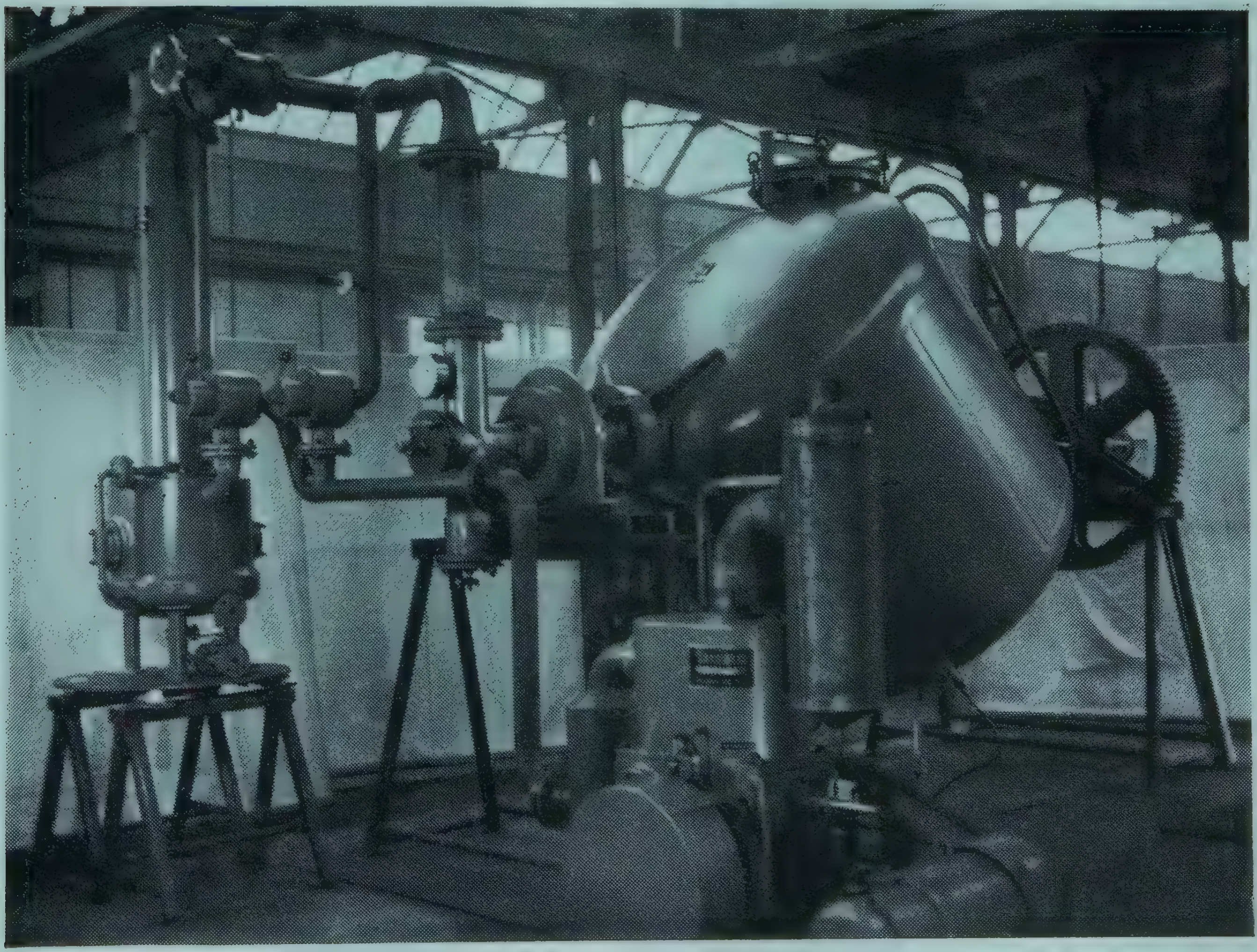
A laboratory model roller drier made by Passburg-Block-Haas-Orthos Engineering Ltd.

Peroxidase Test

Soak a small sample (5 g.) of dried vegetable in 25 ml. of distilled water in a test-tube for one hour. 1 ml. of freshly mixed equal volumes of an aqueous 1 per cent solution of guaiacol and 5-volume strength hydrogen peroxide is added to the vegetable mixture. If a red-brown colour develops in under one minute then peroxidase is present.

Catalase Test

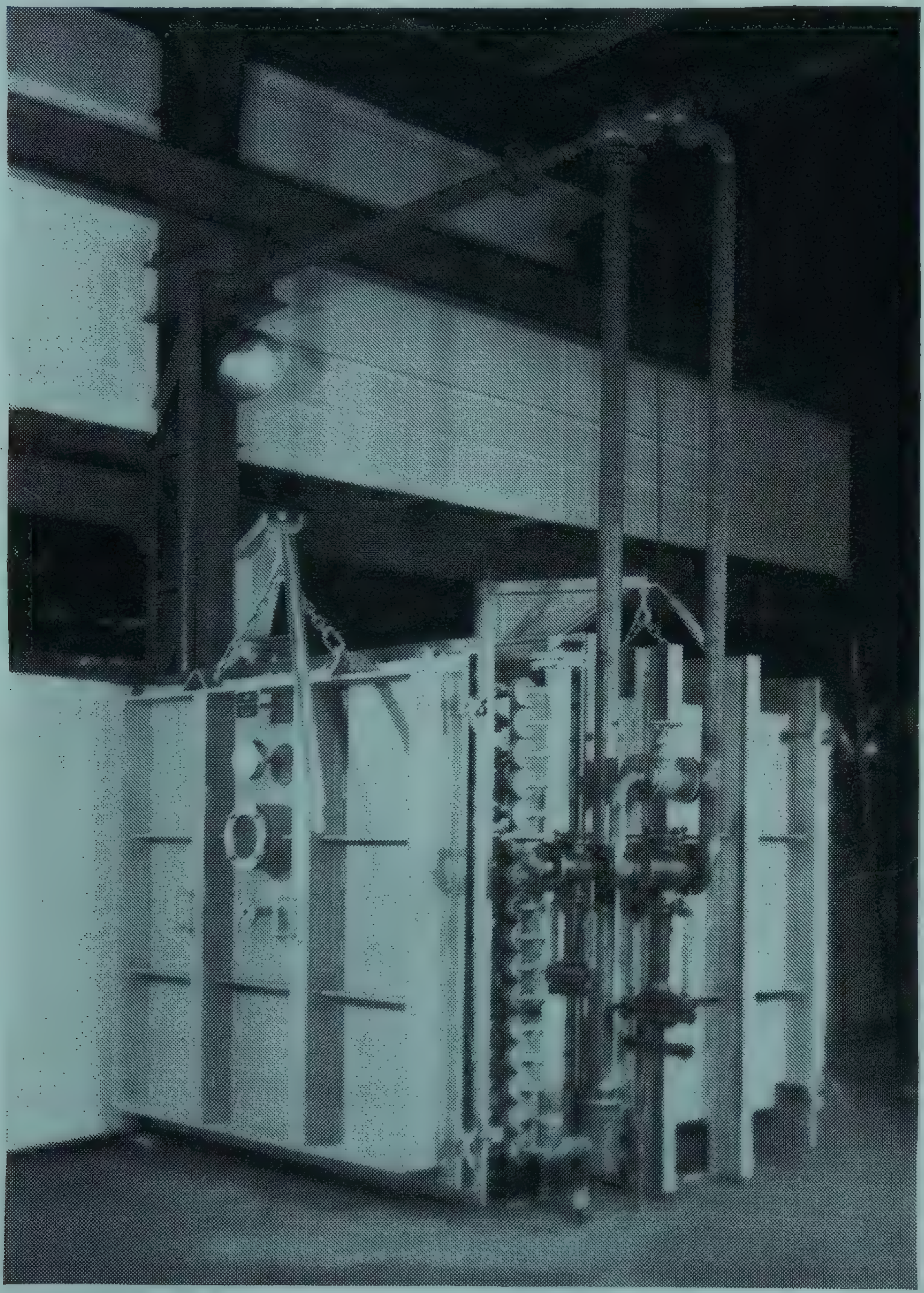
A test-tube is fitted with a rubber stopper through which a capillary tube projects down about one inch into the body of the tube. A sample of the vegetable is ground to a fine powder in a hammer mill or in a mortar and 3 g. are placed in the test-tube. The tube is completely filled with hydrogen peroxide solution so that, on inserting the stopper, the surplus liquid overflows through the capillary. No air-pockets should be present at the top of the test tube. After one hour the presence of catalase is confirmed by the presence of oxygen bubbles



A vacuum tumbler drier made by Passburg-Block-Haas-Orthos Engineering, Ltd.

ascending through the mixture and often a layer of oxygen is present at the top of the tube if the activity is considerable.

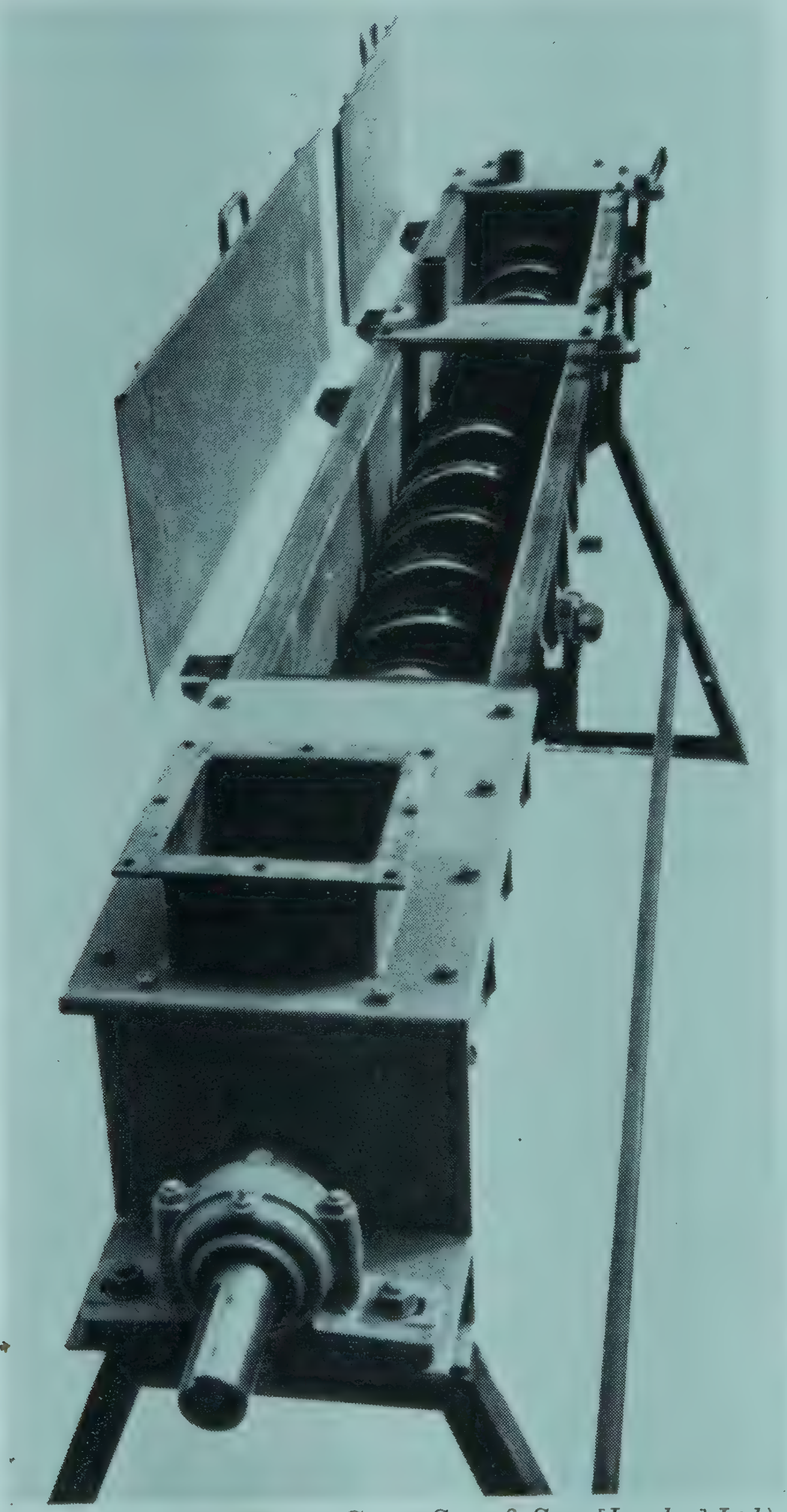
In both enzyme tests controls should be carried out simultaneously with samples of dried vegetables which have been boiled in order that non-enzymic reactions may not give false positive reactions. Typical positive reactions can always be observed with fresh vegetables.



A vacuum drying chamber by Passburg-Block-Haas-Orthos Engineering Ltd.

Cooking tests, to determine the suitability or otherwise of samples, are also necessary and in this case the reconstitution ratio (R.R.) should also be determined. The R.R. will increase with time until complete reconstitution is achieved and the time when the R.R. is at a maximum will not necessarily coincide with the cooking time, i.e. the time when the vegetable is judged to be fully "cooked" as in soup. Ideally the maximum R.R. should approximate to the yield factor from the prepared fresh vegetables but in practice this is rarely so, since irreversible physical and chemical changes play a part in determining the magnitude and rate of reconstitution.

The R.R. is determined experimentally by simmering



(*By courtesy George Scott & Sons [London] Ltd.*)

Scott-Rietz Thermascrew Blancher. This machine uses a hollow, steam heated screw to convey products through the blanching tank.

weighed samples of dried vegetables in water and draining them on a sieve at timed intervals. The sample and sieve are re-weighed each time and eventually the time is reached when no further increase in weight of the sample is noted. The R.R. is then expressed as the maximum weight of reconstituted vegetable divided by the weight of the dry sample. This ratio varies considerably with different vegetables and, in general, is between 4 and 12. Variety, maturity, blanching and drying conditions all affect the ratio and, in general, the more the vegetable has been pre-cooked before dehydration the shorter the period of time before the maximum R.R. is achieved.

As one of the advantages of soup mixes is the saving of preparation time it is obvious that vegetables requiring a relatively short period of cooking should be selected. Furthermore, all the vegetable ingredients in a soup mix should cook in approximately the same time, so that a pleasant "mouth-feel" is experienced by the consumer. It should further be borne in mind that the cooking time may be increased by the presence of other ingredients in the soup mix, notably by common salt.

A final evaluation of the reconstituted vegetables should be made by scoring such factors as flavour, texture, colour and appearance. Samples which give off-flavours, tough textures and discoloration on reconstitution should be discarded.

As a further check on reliability all samples should be examined for sulphur dioxide content. The Public Health (Preservatives, etc., in Food) (Amendment No. 2) Regulations 1953 permit the following maxima for dehydrated vegetables:

	Parts per Million of SO_2
Potatoes	550
Runner beans, turnips, spinach, swedes, peas, parsnips, carrots, mixed vegetables	2,000
Cabbage	3,000

It would appear that a soup mix is only permitted to contain a preservative to the extent that the preservative is present within the prescribed limits in the constituents of the mix; i.e. in the dehydrated vegetables, according to the above table. The method adopted as an official test is that of

Monier-Williams.[4] A useful rapid accurate method is described below.

Determination of SO_2 in Dehydrated Vegetables

An all-glass distillation assembly, consisting of a 1-litre flask with side-tube, a stillhead with side-arm, a double-surface condenser and absorber unit, is used. 10 g. of powdered dehydrated vegetable are soaked in 300 ml. of distilled water in the flask and 25 ml. of concentrated hydrochloric acid are run into the contents after steam has been admitted via the side-tube. The absorber tube is immersed in 300 ml. of distilled water in a beaker to which 10 ml. of 2 N. hydrochloric acid, a few crystals of potassium iodide and 2 ml. of starch solution have been added. Once the steam distillation has commenced N/32 potassium iodate solution is run into the beaker by burette so that the sulphur dioxide is titrated on stirring. Completion of the distillation (five minutes or so) is indicated by a permanent blue colour. The titre of potassium iodate solution multiplied by 100 gives the sulphur dioxide content in parts per million.

Sulphur dioxide plays a large part in retarding the browning reaction of dried vegetables during storage. If vegetables are processed without the use of sulphur dioxide storage of soup mixes containing them will often produce brown discoloration and off-flavours of the "scorched" type. The main reactants in the browning reaction are the amino acids and reducing sugars in the vegetables and SO_2 blocks intermediates in the reactions and thus prevents or retards the complex storage deterioration.

The method described above determines the total SO_2 content, i.e. free SO_2 available for retarding the browning reaction plus bound SO_2 which has chemically reacted already with various constituents in the dried vegetable. It is thus important to determine the relative amounts of free and bound SO_2 in vegetables.

Determination of Free SO_2

10 g. of powdered dehydrated vegetable are reconstituted in cold water and then a few crystals of potassium iodide, 2 ml. of starch solution and 10 ml. of 2 N. hydrochloric acid are added. The mixture is rapidly titrated with N/32 potassium iodate solution until a blue colour is produced. The titre

multiplied by 100 gives free SO_2 plus other reducing substances, such as ascorbic acid, etc. The procedure is repeated except that 10 ml. of formaldehyde are added to the mixture before titration. This result gives the equivalent SO_2 of the other reducing substances. When the latter figure is subtracted from the former the free SO_2 in p.p.m. is obtained.

When the free SO_2 is subtracted from the total SO_2 figure the bound SO_2 is obtained and the ratio of free to bound SO_2 in a dehydrated product will give a sound idea of its storage life under various conditions.

Microbiology of Dehydrated Vegetables

All too often the possibility of introducing micro-organisms into food products via the use of dehydrated vegetables is overlooked. Poor plant sanitation and the improper selection of suitable vegetables can result in material with an appreciable "bacterial load".[5] Incorrect processing is another predisposing factor and dehydrated vegetables with a high bacterial count can confer inherent quality defects on soup mixes.

It is interesting to note that Vaughn[6] isolated starch-fermenting species of the genera *Aerobacter* and *Bacillus* from samples of spoiled dehydrated potatoes. The predominant organisms were *A. aerogenes*, *B. subtilis* and *B. cereus*.

Incidently it is noteworthy that the free SO_2 is also available in treated dehydrated vegetables for bactericidal purposes and the incorporation of SO_2 during processing will tend to prevent bacterial build-up and spoilage.

3. STARCHES AND THICKENERS

Many items may be properly considered under this heading. Noodles are required, of course, for chicken noodle and vegetable noodle soup mixes and all thick soup mixes include in their formulation a certain proportion of flour or starch as a thickening agent to give the soup "body". The following examples of thickeners of this nature are given in descending order of thickening power: farina, Farinoca, arrowroot, cornflour, tapioca, oat flour, wheat starch, barley flour, sago, wheat flour. Other products used in special cases are pea flour, potato flour, rice flour, barley, carob flour and other vegetable flours.

Soya flour is used in soup for its high protein content.

COMPOSITION OF SOYA AND WHEAT FLOURS

	Wheat Flour per cent	*Soya Flour per cent*
Moisture	12·00	6·14
Ash	0·42	5·24
Fat	1·00	20·71
Fibre	0·25	1·72
Protein	12·50	39·56
Carbohydrate	73·83	26·63

Soya flour also has a high fat content and it possesses certain natural antioxidants which confer on it a good storage life.

PHYSICAL PROPERTIES OF COMMERCIAL RAW STARCHES

	Temperature (°F.) at which Gelatinization begins		*Starch Paste*	
	5 Per Cent Solution	*33⅓ Per Cent Solution*	*Texture*	*Clarity*
Corn	176	156	Gel	Opaque
Amioca	165	162	Cohesive	Sl. Clear
Tapioca	145	136	Cohesive	Clear
Sago	165	160	Soft Cohesive	Sl. Clear
Potato	147	142	Soft Cohesive	V. Clear
Wheat	170	140	Soft	Cloudy
Rice	178	167	V. Soft	Cloudy
Arrowroot	167	164	Soft Cohesive	Sl. Clear

Corn starch is the most abundant of all United States commercial starches and is the base for more speciality starches than any other starch.

Amioca is produced from a special "waxy" corn or maize. It is quite dissimilar to corn starch since it gives a clear, fluid and cohesive paste and is non-gelling. It also has less cereal flavour than corn starch.

Tapioca is obtained from the root of a tropical plant called cassava. It is a typical root starch giving cooked pastes which are clear, fluid and cohesive. Tapioca pastes are very stable and it has a bland non-cereal flavour.

Sago starch is refined from sago flour, a native food product from the West Indies. This is, in turn, made from the sago palm. Cooked sago starch pastes are semi-clear, fluid and fairly stable.

Potato starch granules are unusually large and are oval in shape. Potato starch, and converted or processed starches made from it, is used extensively in soup mixes.

Wheat starch gives cloudy, slightly cohesive, soft cooked pastes. It is used a great deal in soup mixes for its lack of flavour and viscosity.

Rice starch has the smallest granules of any commercial starch and cooked pastes made from it are soft and opaque.

Arrowroot comes mainly from the West Indian island of St. Vincent. It is a root-type starch and is similar to tapioca, but has a less cohesive, cloudier and softer paste. Its high price prevents it from being used more widely.

Sorghum starch is now being produced in the United States and it is similar in properties to corn starch.

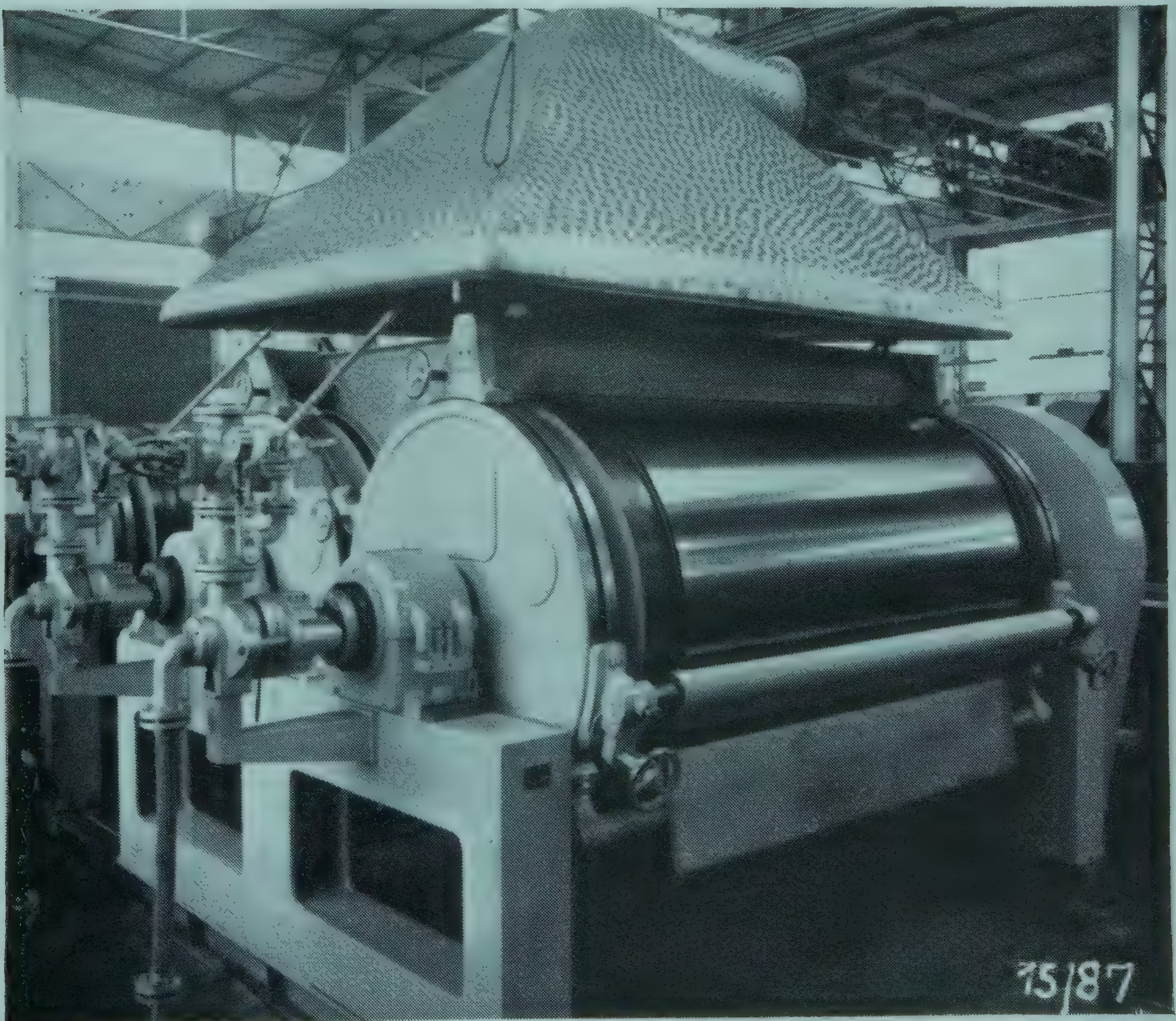
Sweet potato starch is in the stage of development in the United States and its production is hampered at present by economic factors. It is quite different from white potato starch, resembling a mixture of corn and tapioca starches in properties. Cooked pastes of sweet potato starch are soft, cloudy and relatively stable.

In evaluating these items for use in soup mixes the following factors should be investigated: moisture content, thickening power, and stability. The moisture content is usually determined by oven drying, as in the case of dehydrated vegetables. The thickening power or viscosity characteristic is determined by determination of the viscosity in a Redwood viscometer under controlled conditions. This property is of great value in formulation problems as well as in raw material evaluation.

The stability of a farinaceous material is of interest where the storage life of a mix requires evaluation. Certain flours contain enzymes known as lipases (fat-splitters) which catalyse the splitting of fats on storage to give free fatty acids. Oat flour is particularly prone to a high lipase content and, on storage, the lipolytic action of the enzyme can give rise to typical "soapy" off-flavours. In a soup mix not only the natural flour fat but also the added fat can be affected in this way. The lipase value of a flour can be determined by incubating the sample of flour with fat, intimately mixed, at a temperature of 80°–100° F. for a period of time, and then determining the free fatty acid content by titration with standard alkali. The results can be expressed as a percentage of oleic acid, for example, and correlated with taste tests to determine the onset of off-flavour development.

The fat fraction of flours and soup mixes containing fat is also liable to undergo oxidative rancidity in which the fatty fraction is autocatalytically split into substances giving rise to typical "stale" and "cardboard" odours and flavours. A similar reaction also occurs with the small fat or lipid fraction of dehydrated vegetables. The course of oxidative rancidity can be followed by determining the peroxide value[7] which again should be correlated by taste tests with the onset of perceptible rancid flavours. During storage there is an induction or lag period at the beginning during which little peroxide formation occurs. At the end of this period a very sharp rise in peroxide value usually occurs, often accompanied by rancidity perceptible by odour and flavour.

The peroxide value can be conveniently determined by



An Escher Wyss Twin Drum Sump Drier suitable for drying soup mix materials.

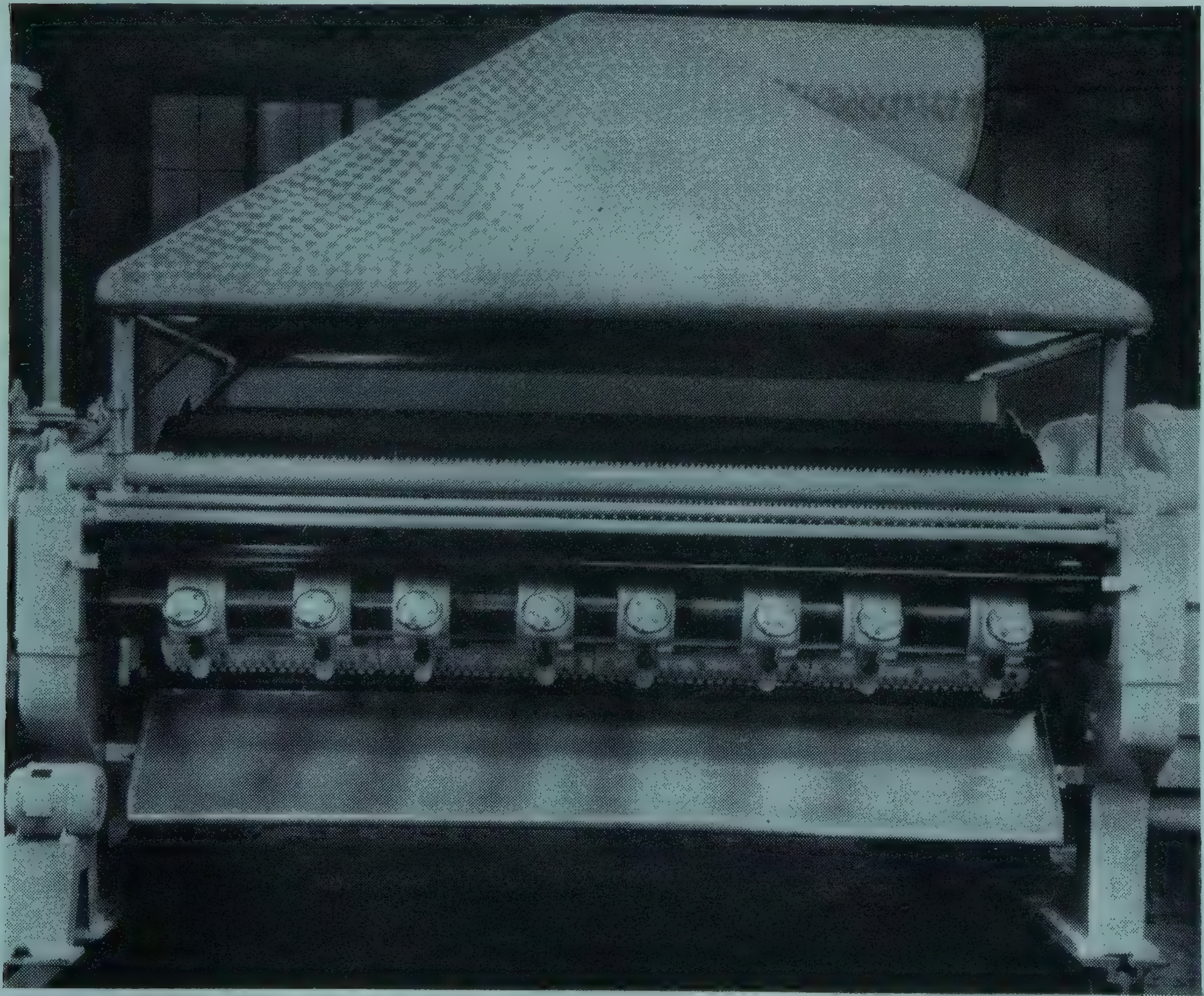
extraction of the material with a chloroform-acetic acid solvent and subsequent titration with N/500 sodium thiosulphate solution. A starch-iodide indicator is used and the titration is carried out in the absence of air.

Noodles, as a speciality flour product, require to be tested for cooking quality as well as for structural strength. In all cases the farinaceous products should be tested for behaviour on cooking in the actual soup mix after various storage periods, as sometimes physical changes take place in the starch fraction. These changes are sometimes apparent as separation of the flour or starch on cooking, giving rise to "watery" soups. Retrogradation of the starch is responsible for this type of fault.

Final check tests on batches of flour products should include examination for presence of extraneous matter, which would be evidence of insanitary practices during processing.

4. SALT AND FLAVOURINGS

Common salt (sodium chloride) is an ingredient of all soup mixes, the amount used depending on the type of soup and on



An Escher Wyss Twin Drum Spray Drier.

any consumer preference in certain countries and areas. There appears to be a decided preference for high salt contents in soup mixes in the United States. The actual salt content of a soup mix will normally be fairly high since the mix will normally give 1–1¾ pints of reconstituted soup and the salt content will have to allow for the final concentration as consumed.

Monosodium glutamate (M.S.G.) is used quite frequently in formulations on account of its unique property of bringing out and accentuating flavours of other ingredients. M.S.G. is the monosodium salt of glutamic acid, an amino acid occurring in many proteins and occurring also in certain protein hydrolysates used in soup mixes. Originally used in the Far East as a flavour improver, M.S.G. is now used throughout the world as an ingredient of meat products, fish products and soups. The common name for M.S.G. is "Aji-no-Moto" which means, appropriately enough, "essence of taste" in Japanese.

Without knowing the full scientific reasons for its success as a flavour modifier we can summarize the effects of M.S.G. in savoury foodstuffs:

1. A general sense of mouth satisfaction is obtained and salivary secretion is stimulated.

2. When the added salt content is 0·1 – 1·0 per cent it has been shown that M.S.G. in the range of 0·1–0·2 per cent increases saltiness. At higher levels of salt content M.S.G. appears to diminish saltiness in some foods and increase it in others.

3. M.S.G. accentuates low levels of sugar when near their optimal value.

4. M.S.G. can, at the 0·05 – 0·5 per cent level, reduce the sour flavour of tomatoes.

5. Bitterness is reduced in spinach but this effect is not general. Some metallic flavours are suppressed by M.S.G. and hence it is particularly useful in canned foods from this point of view.

6. M.S.G. assists in producing a blended flavour in foodstuffs.

7. Certain unpleasant flavour factors in foods are suppressed.

8. Production of "bloom" results in flavour being spread rapidly inside the mouth.

9. After eating there is produced by M.S.G. an after-sensation on the tongue which invites further eating.

Flavourings are sometimes used in soup mixes as essences and essential oils adsorbed on dry powder bases. Certain spice oils are also of use in this connection and they can be conveniently handled by using salt as the adsorbent ("Saromex" spice extracts on salt—Stafford Allen & Sons Ltd.). The greatest advantage from a stability point of view is that these extracts are free from bacteria and do not add tannin and fibre to the soup mix. They are also of value in that they can be used to give very accurately controlled dosage in mixes. The amount of salt in these preparations should be allowed for in computing the total salt content of the soup.

Meat extract is a traditional ingredient of soups but its use is minimized by the high price, owing to the great shortage at the time of writing. It is often readily replaced by hydrolysed protein and autolysed yeast extract. In Scandinavia whale-meat extract is used in soup blocks and soup mixes to a large extent owing to the whaling activities, but since whalemeat itself must be declared as such the extract should also and it is not used in the United Kingdom at the time of writing.

5. Herbs and Spices

Herbs and spices are used extensively by soup manufacturers for providing a full rounded flavour to complement the predominant flavour of each type of soup mix. They may be defined as "Aromatic vegetable substances used for flavouring food". Very complex fixed and volatile oils are responsible mainly for the flavour of these items although each flavour is compounded of very many different chemical compounds.

The examination of herbs and spices as potential raw materials for soups should include a microscopic examination plus determinations on the moisture content, total ash, water-soluble ash, acid-insoluble ash, ether extract (volatile), ether extract (non-volatile) and alcohol extract.

Pepper

The dried unripe berries of the pepper vine, *Piper nigrum*, give the black pepper of commerce whereas white pepper is obtained from the dried mature fruit of the same plant.

Cayenne pepper is obtained from the orange-red pods of *Capsicum frutescens*, *Capsicum baccatum* and other species. Paprika comes from the large pods of *Capsicum annuum* and it is, incidentally, a rich source of ascorbic acid. Pimiento, or Spanish red pepper, is a type of paprika grown in Spain.

Ginger

Ginger is the dried rhizome (underground stem) of the perennial plant *Zingiber officinale* and it is marketed unpeeled, peeled or dried.

Cinnamon

This spice is produced from the dried inner bark of the young shoots of an evergreen member of the laurel family, *Cinnamomum Zeylanicum*. It may be marketed as the familiar sticks of commerce or as a powder ready for use.

Pimento (Allspice)

Pimento is the dried berry (picked unripe) of a tree of the myrtle family, *Pimenta officinalis*. The term "allspice" was given to this spice because its aroma and flavour resemble a mixture of cloves, cinnamon and nutmeg.

Cloves

Cloves are the dried unopened flower-buds of the evergreen *Eugenia caryophyllata*. The best-quality cloves have a bright reddish-brown colour and a total ether extract of about 20 per cent.

Cardamoms

These are the small seeds of a plant of the ginger family, *Elettaria cardamomum*. The fruit capsules are gathered before they ripen and split open so that the full aroma is preserved. They are an ingredient of curry powders and are useful for meat soups.

Nutmeg and Mace

These spices are different parts of the fruit of *Myristica* *fragrans*. The nutmeg is the kernel of the dried nut whereas the dried aril or covering is mace.

Mustard

Commercial mustard is a mixture of the flours of brown mustard seed (*Brassica nigra*) and of yellow mustard seed (*Sinapis alba*). The essential glycosidic principles of the seeds are hydrolysed by enzymatic action when mustard is mixed with water.

Celery Seed

This is the dried fruit of *Apium graveolens L.* and it is a useful component of celery and other soup mixes.

Parsley

Parsley leaves and seeds are both useful for soup formulation. Parsley is a biennial herb cultivated to a large extent in Great Britain.

Coriander

Coriander is the dried fruit of *Coriandrum sativum L.* The plant is an annual herb of the parsley family and the fruit is completely ripe before harvesting to achieve a typical flavour and aroma. The seed is of a light brown colour and in the ground form is extensively used in meat products and soups.

Sage

This is the dried leaf of *Salvia officinalis L.*, a perennial shrub of the mint family. Sage contains up to 3 per cent of volatile oil and is used for flavouring meat soups.

Thyme

Thyme consists of the dried leaves and flowering tops of the herb *Thymus vulgaris*, an annual of the mint family. The volatile oil is about 2 per cent and consists mainly of thymol with carvacrol. Thyme is used for meat product flavouring.

Mint

Mint is derived from *Mentha viridis* and consists mainly of the leaf, but often contains a little stem tissue also. The ash is usually 10–12 per cent and the volatile oil up to 1·5 per cent.

Marjoram

This consists of the dried leaves, with or without flowering tops, of *Marjorana hortensis* Moench.

Curry Powder

Curry powder is a condiment containing ready-mixed herbs and spices suitable for curry preparation. Cayenne pepper, ginger and turmeric are the principal spices used and a small amount of farinaceous material and salt is usually present. Curry powder is often an ingredient of mulligatawny soup.

Cumin Seed

This is the dried fruit of *Cuminum cyminum L.*

Dill Seed

Dill seed is the dried fruit of *Anethum graveoleus L.*

Fennel Seed

Fennel is the dried fruit of cultivated *Faeniculum vulgare* Hill.

6. Colourings, Acids and Alkalis

Any desired colour can be imparted to a soup mix, in addition to that provided by the usual ingredients, by using the permitted dyestuffs.[8] The colours can be used in the form of the dry dyestuff or added as a dilute solution to the pre-mix before dehydration.

Caramel is a very suitable material to use for certain mixes

A rotary vacuum drier.

containing meat ingredients and it can be added in its usual concentrated form to the final mix since its high solids content will not alter the moisture content of the blend to any great extent.

Occasionally it may be necessary to use certain acids or alkalis to alter the pH of a soup mix to achieve a well-rounded flavour. In the case of a tomato soup the addition of an alkali to the wet mix prior to dehydration will raise the pH to a level concomitant with a good tomato flavour. High acidity in tomato purée used for dehydration can give a sharp acidic flavour undesirable to many palates. Citric and tartaric acids can be used as desired to give a slightly more acidic flavour to soup mixes that would otherwise be slightly "dull" or "flat" to the palate. In these cases the acid is used in the powdered form and is added to the final mix.

It is interesting to note that the storage life of certain soup mixes is dependent on the pH of the mix. The browning of certain ingredients and the development of off-flavours are often related to pH of storage, as well as other factors, and occasionally it may be necessary to alter the pH in order to prolong the shelf life.

7. Fats

The selection of the fat component for a soup is important since factors such as the mouth-feel, flavour and shelf-life are influenced by the type of fat used.

Animal fats are often used in meat soups where they can give additional flavour to a predominantly "meat" soup. Similarly chicken fat is used in chicken soup mixes. Hardened vegetable oils, however, are most commonly in use because such fats can be modified during manufacture to give products "tailored" for the particular mixes in mind. The fat must be suitable for mixing with the other ingredients, in a plastic condition either hot or cold, and suitable also for storage and as a component of the reconstituted soup.

It is obvious that the fats used require to be fresh, pure and free from taint and rancidity. The usual rancidity tests are suitable, the most useful probably being the Swift Stability Test,[9] in which the fat is subjected to controlled accelerated ageing by exposure to heat and oxygen. The Lea peroxide test is also useful in providing evidence of potential rancidity.

Synthetic antioxidants are now permitted in the United Kingdom since The Antioxidant in Food Regulations 1958 (S.I. No. 1454) were promulgated and the use of them in soup mixes is beneficial in retarding rancidity.

Edible oils may now contain 100 p.p.m. of n-propyl gallate or n-octyl gallate or n-dodecyl gallate or any mixture thereof; 200 p.p.m. of butylated hydroxyanisole (B.H.A.); or 200 p.p.m. of butylated hydroxytoluene (B.H.T.); or 200 p.p.m. of any mixture of B.H.A. and B.H.T. B.H.A. and B.H.T., or mixtures thereof, may also be used in conjunction with the gallates provided that the total amount of antioxidant is not more than 300 p.p.m. Declaration of antioxidants in foodstuffs is not necessary for retail packs, according to these regulations.

THE BALDWIN N.P.L. MOISTURE DETERMINATION METER

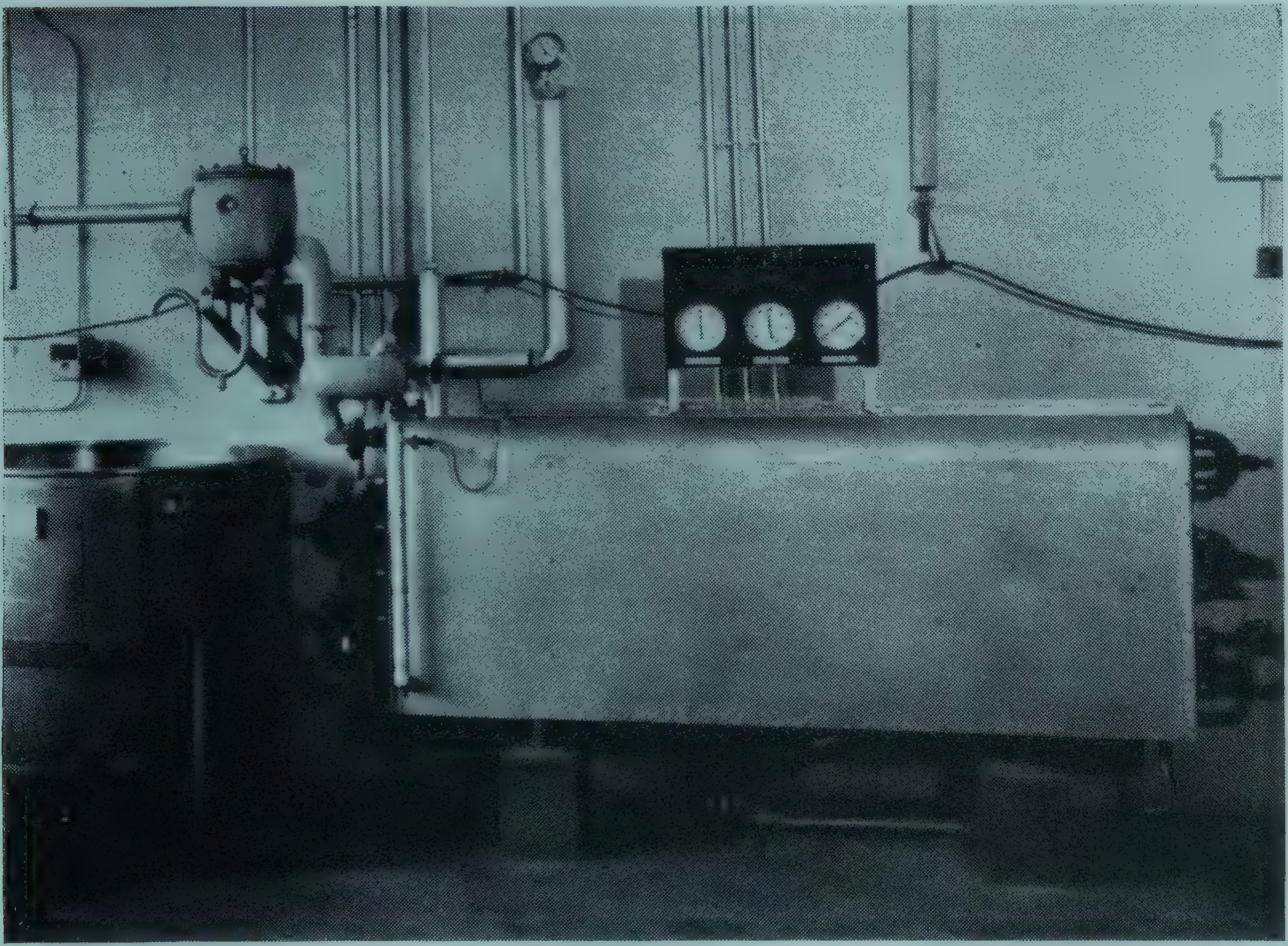
For testing dried peas or beans.

Chicken fat is a useful component of chicken and chicken noodle soup mixes. It should be prepared by rendering at 240° – 250° F. for a period of not more than 2½ hours and it should be thus processed within three months of removal from the birds. Heavy metal contamination should be avoided and the fat should have the following characteristics:

Peroxide Value	Not more than 3·0
Free Fatty Acids	Not more than 1·2 per cent
Moisture	Not more than 0·25 per cent

Hydrogenated vegetable oils and fats are the most commonly used types for soup mixes since virtually any property can be obtained by hydrogenation or hardening. The following fats are of interest in this connection: coconut, palm kernel, ground nut, corn, cotton seed and soya bean.

Occasionally it should be necessary to test the incoming batches of oils and fats for suitability for soup mix manufacture and for adherence to purchase specifications. In this connection the following tests may be carried out:



A Kestner stainless steel horizontal type evaporator used very satisfactorily for concentrating soup mixes. On the left is a stainless steel receiving vessel in which the concentrated soup is collected.

Saponification Value

This is defined as the number of milligrams of potassium hydroxide required to saponify one gram of fat.

The result of this test can assist in defining the nature of the combined fatty acids present. Values of over 200 indicate the presence of low molecular weight fatty acids whereas values below about 190 indicate high molecular weight fatty acids.

Saponification Equivalent

The definition of this test is the number of grams of fat saponified by one gram-equivalent of potassium hydroxide.

The Saponification Equivalent may be derived from the following equation:

$$\text{Saponification Equivalent} = \frac{56100}{\text{Saponification Value}}$$

In the absence of free fatty acids and unsaponifiable matter the Saponification Equivalent is the mean equivalent weight of the glycerides in the fat or oil and one can calculate the mean molecular weight of the combined fatty acids.

Acid Value

The Acid Value is the number of milligrams of potassium hydroxide required to neutralize the free fatty acidity of one gram of oil or fat.

Low Acidity Values indicate purity of oils and the regular determination of Acid Value on stored fats and soup mixes will give an indication of storage life.

Ester Value

This is defined as the number of milligrams of potassium hydroxide required to saponify the neutral glycerides present in one gram of oil or fat.

The Ester Value can be obtained by subtracting the Acid Value from the Saponification Value.

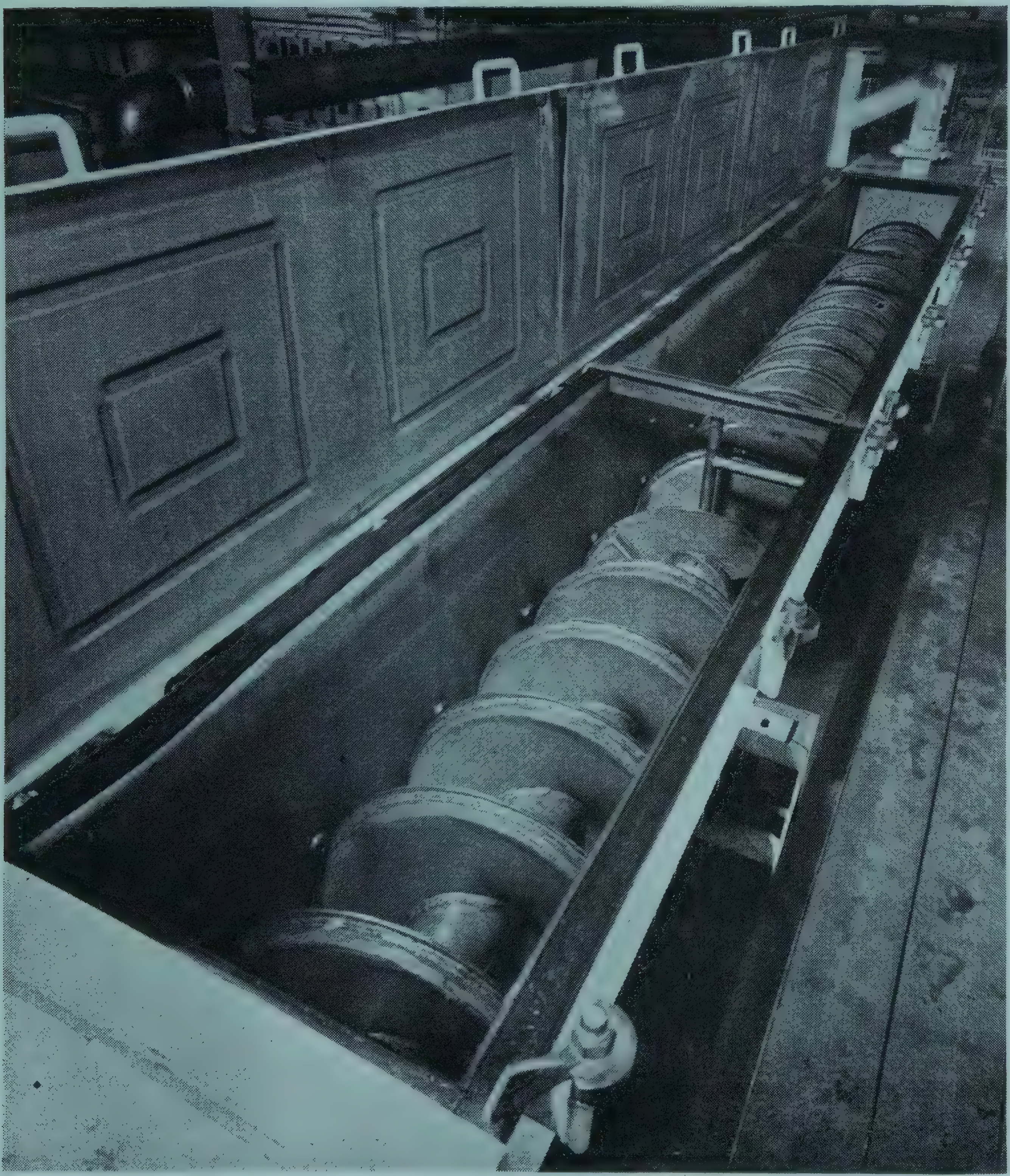
Refractive Index

A refractometer is used in the laboratory to measure the amount of refraction caused to a beam of light under standard conditions when passed through a sample of oil or fat.

The Refractive Index (R.I.) is similar to the Iodine Value in so far as it shows the degree of unsaturation in a fat. The higher the Iodine Value the higher the R.I.

Peroxide Value

The Peroxide Value is expressed as the milli-equivalents of peroxide oxygen per kilogram of fat or oil. The significance of peroxides in fats is discussed in section 3 above.



(By courtesy George Scott & Son [London] Ltd.)

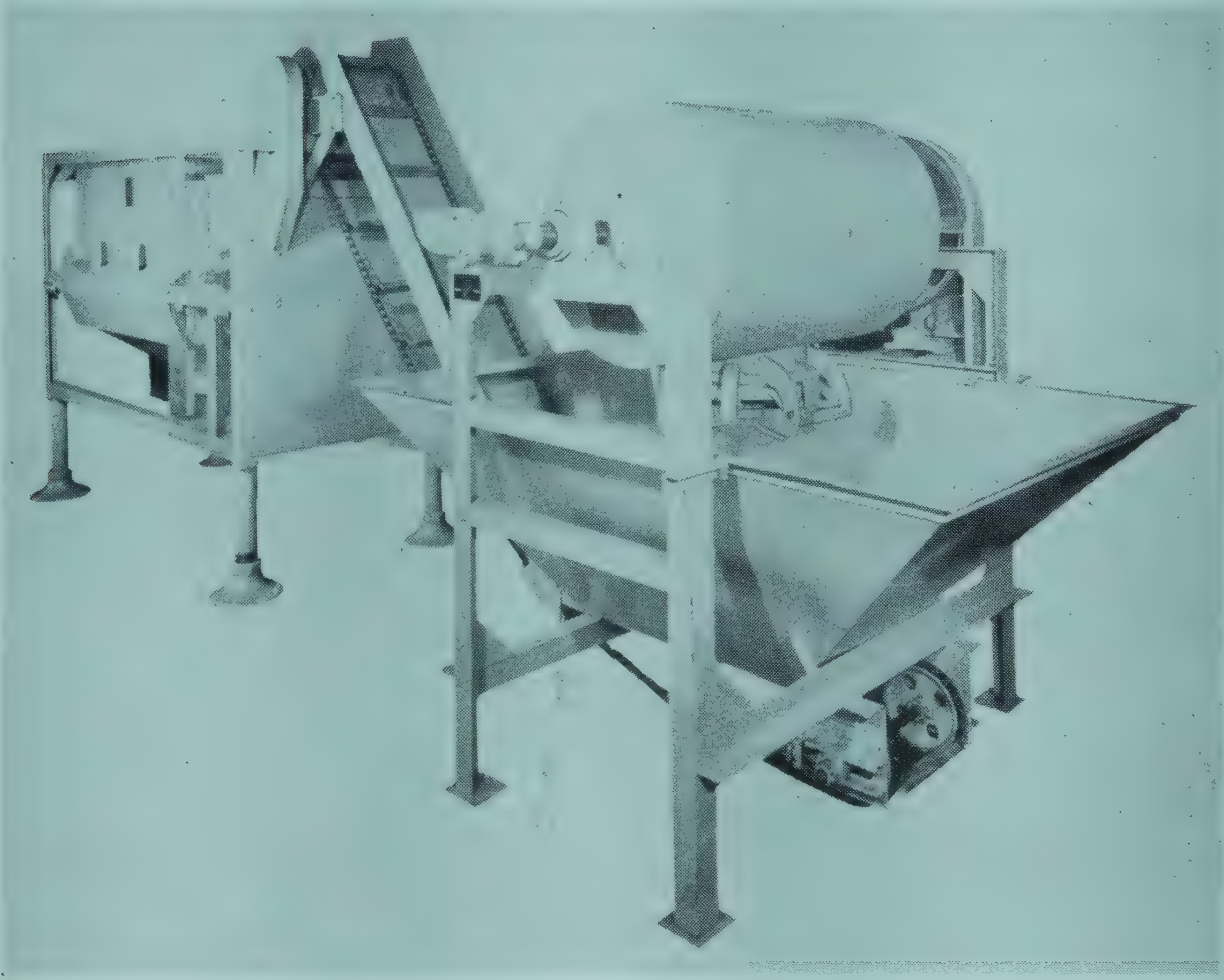
Internal view of the Scott-Rietz Thermascrew Blancher comprising a hollow stainless steel screw 16 in. in diameter running in a stainless steel trough 20 feet long. This machine may be used for blanching vegetables prior to dehydration. The screw section may be heated by passing steam through it. Vegetables in the trough may be subjected to treatment by line steam from the manifold through injection nozzles.

Volatile Acids

The Reichert Value defines the amount of water-soluble steam-volatile fatty acids in a fat.

The Polenske Value is a measure of the water-insoluble steam-volatile fatty acids in a fat.

The Kirschner Value gives a definition of the water-soluble steam – volatile fatty acids in a fat which form water-soluble silver salts.



(*By courtesy A. K. Robins & Co. Inc.*)

THE ROBINS STEAM PEELER

Semi-automatic high pressure Steam Peeler for all root vegetables. Capacity up to 8,000 lb. of vegetables per hour.

It should be emphasized that these three values are empirical in nature but they assist in deciding whether certain fats are present in a mixture.

Unsaponifiable Matter

This material remains non-volatile when the fat is dried at

80° C. to constant weight, after the fat has been saponified by alcoholic potassium hydroxide and after solvent extraction.

Hydrocarbons, sterols and higher alcohols are included in the unsaponifiable matter and most oils and fats contain less than 2 per cent. Animal and vegetable fats can be differentiated by the different sterol present in each type of fat.

Iodine Value

When a fat is treated with iodine, under certain conditions, some iodine is usually absorbed and the amount so absorbed chemically is defined as the Iodine Value.

The highest Iodine Values are found in those fats with the largest amounts of unsaturated acids, and *vice versa*. When fats and oils are hydrogenated or "hardened" the unsaturated acids react with hydrogen and then the Iodine Values will be low. They are useful guides to purity and stability.

8. PROTEIN PRODUCTS

To confer added savoury flavour and nutritional value in soup mixes and canned soups many animal and vegetable proteins are hydrolysed under special conditions and then neutralized to give liquors, pastes and powders containing amino acids and the sodium salts of amino acids. Approximately eighteen amino acids are usually present in hydrolysed protein (such as "Protex") and these are mainly responsible for the flavour and flavour-enhancing qualities of this material.

Typical analyses of grades of "Protex" manufactured in this country at present are as follows:

	Animal and Vegetable Hydrolysed Protein		*Vegetable Hydrolysed Protein*		*Wheat Gluten Hydrolysed Protein*
	Paste	*Powder*	*Paste*	*Powder*	*Paste*
Moisture %	16–19	3–6	15–19	3–6	15–19
Salt %	35–38	51–56	37–40	51–57	36–40
pH	4·9–5·2	4·7–5·0	5·0–5·3	4·6–4·9	4·7–5·0
Total Nitrogen %	6·4–7·2	5·0–5·7	5·2–6·0	5·0–5·7	6·6–7·2
Amino Nitrogen %	5·5	4·6	4·7	4·6	5·5
M.S.G. Content %	7·0	5·0	7·5	6·5	10

A typical amino acid analysis of a wheat gluten hydrolysate appears below:

	Per cent
Aspartic Acid	1·30
Threonine	0·90
Serine	1·80
Proline	3·50
Glutamic Acid	13·20
Glycine	1·30
Alanine	1·00
Valine	1·00
Iso-leucine	0·55
Leucine	0·95
Tyrosine	0·07
Phenylalanine	1·15
Lysine	0·65
Histidine	0·70
Arginine	1·20

M.S.G. has been discussed in section 4 above although it may be argued that it is not a flavouring in the true sense of the word but that it is, technically, a protein derivative.

Autolysed yeast extract is a very valuable product for use in soups since it confers a rich meaty flavour and supplements the soup nutritionally on account of its B group vitamin content.

In the production of autolysed yeast extract the brewer's yeast is autolysed in an aqueous medium at an elevated temperature and then the enzymes are heat-inactivated. The liquor is centrifuged off and then decolorized before filtration. The yeast extract liquor is finally concentrated *in vacuo* and filled into suitable containers.

A typical analysis for autolysed yeast extract ("Yeatex") is as follows:

Moisture	26 to 30 per cent
Total Chloride (as NaCl)	10 to 12 ,, ,,
Total Nitrogen	6·5 to 7·0 ,, ,,
Amino Nitrogen (Van Slyke method)	3·4 per cent approx.
Mineral Matter	16·0 ,, ,, ,,
Phosphoric Acid (P_2O_5)	3·0 ,, ,, ,,
Carbohydrates	13·0 ,, ,, ,,
pH of 5 per cent solution	5·4 to 5·9
Vitamin B_1	18 mcgms/gram approx.
Vitamin B_2	18 ,, ,, ,,
Nicotinic Acid	400 ,, ,, ,,

and most other factors of the B group of vitamins.

Amino acids:

Arginine	2·0 grams/100 grams.
Histidine	1·3 ,, ,, ,,
Lysine	3·3 ,, ,, ,,
Tyrosine	1·6 ,, ,, ,,
Tryptophane	0·6 ,, ,, ,,
Phenylalanine	2·0 ,, ,, ,,
Cystine	0·5 ,, ,, ,,
Methionine	0·9 ,, ,, ,,
Threonine	2·4 ,, ,, ,,
Leucine	3·3 ,, ,, ,,
Iso-leucine	2·6 ,, ,, ,,
Valine	2·5 ,, ,, ,,
Glutamic Acid	6·5 ,, ,, ,,

Dried debittered yeast and dried yeast food (torula yeast) may also be used for soups since they are useful nutritional supplements.

The approximate protein content of a soup may be estimated by the Kjeldahl method whereby the total nitrogen content is determined and this, when multiplied by the appropriate conversion factor (usually 6.25) gives the protein content.

9. Sugars

Sugar is incorporated into soup mixes in the form of finely milled cane sugar (sucrose). The level is fixed by prior tasting tests and the amount in production samples determined by extraction and estimation by the usual cuprometric methods.

Occasionally glucose or lactose may be used when these "special" sugars are desired. Dried corn syrup solids are also useful in certain soup mix formulations. It should be noted that sweetness tends to depress acidity in soup flavour and *vice versa*.

10. Milk Products

To give the effect of a creamy texture on reconstitution dried whole milk powder is used but under certain conditions instability of the butterfat fraction is obtained on storage, giving rise to off-flavours.

Skimmed milk powder (S.M.P.) made from fat-free milk solids is therefore used when added "body" and creaminess are required. S.M.P. also has a beneficial effect on flavour.

FORMULATION

The question of formulation of soup mixes is an entirely individual one to be decided by the manufacturing company concerned after suitable organoleptic research and development and after appropriate consumer market research.

The formulae given below are only to be regarded as experimental and in no sense should they be considered as complete and ready for blending before suitable investigation has been undertaken.

The varieties of soup mixes are legion and the types to be marketed will vary with the sales area of the country, as soup preferences vary considerably. It is essential that dehydrated vegetables and other materials are purchased from reliable suppliers and this applies to the various spices, spice concentrates and flavourings also. The thickness or viscosity of the reconstituted soup will, of course, vary with the type and quantity of the starchy ingredients, with the dehydrated vegetables, etc., and with the amount of water to be added to the packet of soup mix in accordance with the directions for reconstitution.

Soup mixes are currently marketed in two sizes, the small one retailing for about one shilling and the larger for about one shilling and sixpence; but the packet size and price are naturally at the discretion of the manufacturer.

It should be noted that a manufacturer of soup powder was prosecuted[10] a few years ago because his product, a "cream of mushroom soup", contained only 0·6 per cent of fat when reconstituted. The Public Analyst concerned stated that, in his opinion, "cream soup" should contain not less than 3·5 per cent of fat, or 2·5 per cent if the whole of the fat is butterfat, thus considering that soup mixes should conform, in part, to the Code of Practice for canned soups.

Perhaps it is superfluous to note that all current food legislation should be carefully studied before manufacture of soup mixes is attempted in order to ensure that the food laws and Food Standards Committee recommendations are followed and anticipated. A further point to note is that in accordance with the Labelling of Food Order the ingredients of a mix must be declared on the packet in descending order of magnitude. These ingredients are generally declared in the dried state but it is the apparently permissible practice to include items in the form "prior to dehydration" although, in the Authors' opinion, this latter practice may be misleading. The net weight of the contents, number of servings and directions for preparation should also be given on the foil envelope. Sometimes the price is also printed.

CREAM OF TOMATO SOUP MIX

	Per cent
Edible Fat	24·500
Tomato Powder	17·921
*Wheat Flour	16·800
*Skim Milk Powder	15·100
Sugar	14·000
*Salt	4·85
Onion Powder	4·85
*Protex No. 5 Powder	1·20
M.S.G.	0·60
Ground Cinnamon	0·088
Ground Marjoram	0·040
Ground Black Pepper	0·024
ICI Edicol Supra Orange AG.	0·016
Sodium Bicarbonate	0·011
	100·000

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Fill 94 g. into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Mix the contents of one packet with 1 pint of cold water and bring to the boil before serving.

MULLIGATAWNY SOUP MIX

	Per cent
*Wheat Flour	33·70
*Beef Powder	27·00
*Salt	11·09
Tomato Powder	8·41
Sugar	6·74
Curry Powder	5·04
Onion Powder	3·57
Beef Fat	1·95
M.S.G.	0·88
Ground Paprika	0·67
Ground Turmeric	0·44
Protex No. 5 Powder	0·34
Caramelline H6168	0·20
Ground Marjoram	0·07
Ground Clove	0·05
Ground Thyme	0·05
	100·00

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Fill 56 g. into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Mix the contents of a packet with 1 pint of cold water, bring to the boil and simmer for a few minutes before serving.

CREAM OF MUSHROOM SOUP MIX

	Per cent
Skim Milk Powder	32·65
Fat	26·10
*Wheat Flour	26·10
*Salt	5·35
Dehydrated Mushroom Pieces	4·50
Dehydrated Mushroom Powder	2·25
M.S.G.	1·62
Onion Powder	0·81
Sugar	0·54
Saromex White Pepper (on salt)	0·07
Saromex Clove (on salt)	0·01
	100·00

Method

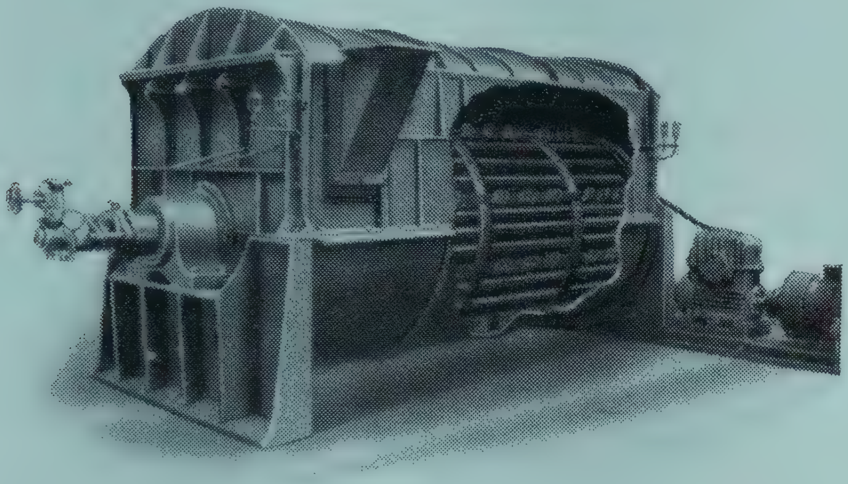
Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Fill 87 g. of the mix into each 4-ply laminated soup pocket and seal.

Reconstitution

Mix the contents of a packet with 1 pint of cold water, bring to the boil and simmer for 10–15 minutes.



(*By courtesy Richard Simon & Sons Ltd.*)

The Simon patent Tubular Dryer for the drying of flour and starch for use in soup mixes.

CHICKEN NOODLE SOUP MIX

	Per cent
Salt	37·86
M.S.G.	21·70
Chicken Fat	16·30
Dehydrated Chicken	14·08
Wheaten Base	3·26
Onion Powder	2·72
Sugar	1·74
Protex No. 5 Powder	1·36
Dried Parsley	0·54
Ground White Pepper	0·22
Ground Turmeric	0·22
	100·00

Method

Mix all the ingredients thoroughly.

Packaging

Fill 17 g. of the soup mix and 40 g. of noodles into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Add the contents of a packet to 1 pint of boiling water and simmer until the noodles are tender, about 5–7 minutes.

KIDNEY SOUP MIX

	Per cent
*Wheat Flour	49·10
*Salt	16·66
*Beef Extract	8·42
Kidney Powder	8·42
*Beef Fat	4·21
Yeatex Powder	4·21
Onion Powder	4·21
*M.S.G.	2·10
Protex No. 5 Powder	2·10
Caramel	0·21
Ground Thyme	0·14
Ground White Pepper	0·11
Ground Bayleaf	0·11
	100·00

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Fill 44 g. into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Mix the contents of one packet with 1 pint of cold water, bring to the boil and simmer for 3–5 minutes before serving.

MOCK TURTLE SOUP MIX

	Per cent
*Wheat Flour	27·30
*Beef Powder	17·02
*Onion Powder	13·65
*Carrot Powder	11·40
Tomato Powder	10·80
*Salt	9·10
M.S.G.	2·85
Beef Fat	2·85
*Protex No. 5 Powder	2·27
*Yeatex Powder	2·27
Ground Thyme	0·15
ICI Edicol Supra Orange AG.	0·11
Ground Bay	0·07
Ground Coriander	0·06
Ground Paprika	0·05
Ground White Pepper	0·05
	100·00

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

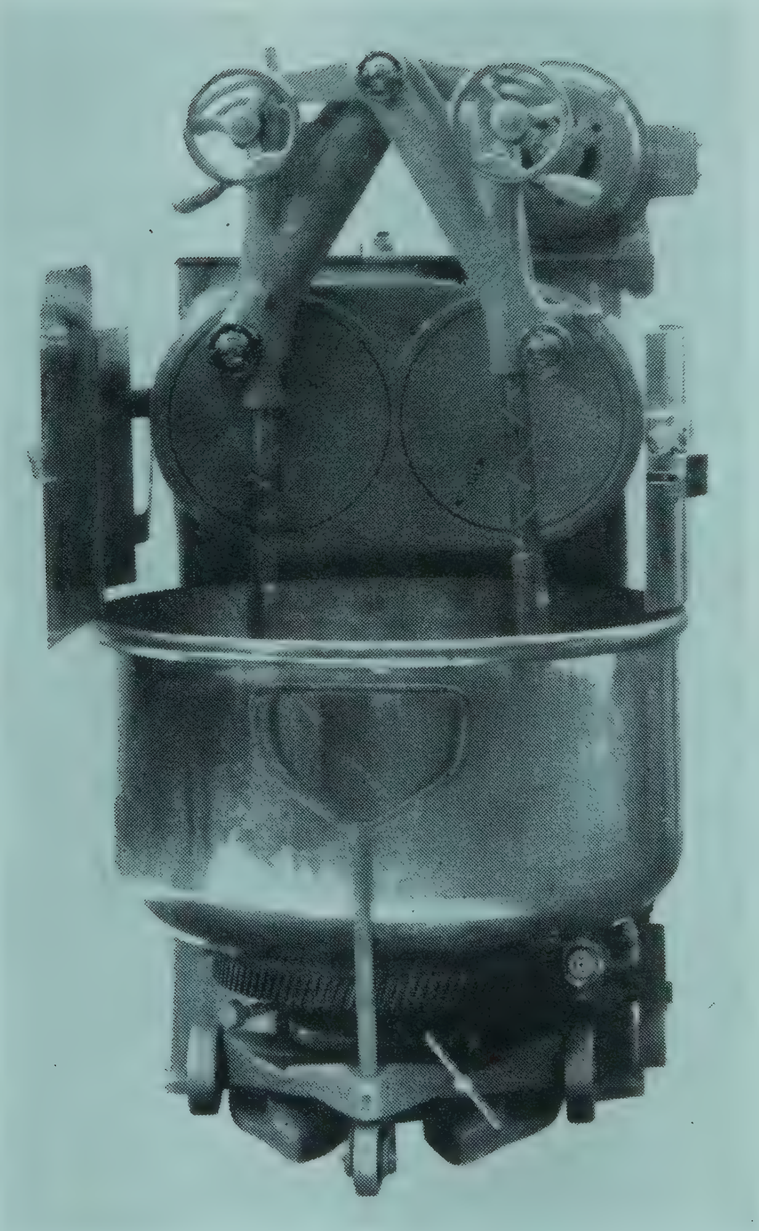
Fill 56 g. of the mix into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Mix the contents of a packet with 1 pint of cold water, bring to the boil and simmer for a few minutes before serving.

MEAT SOUP MIX

	Per cent
*Beef Powder	23·10
*Wheat Flour	23·10
*Carrot Powder	23·08
*Onion Powder	17·30
*Salt	8·78
Beef Fat	1·88
M.S.G.	1·66
*Protex No. 5 Powder	0·88
Ground White Pepper	0·15
Caramelline Powder H6168	0·07
	100·00



Standard type Artofex Mixer suitable for soup mix ingredients.

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Use 4-ply laminated soup pockets, fill 56 g. of mix into each and heat seal.

Reconstitution

Mix the contents of a packet with 1 pint of water, bring to the boil and simmer for 5 minutes.

The Artofex Bowl Tipper suitable for handling soup mixes.

OXTAIL SOUP MIX

	Per cent
*Wheat Flour	45·20
*Salt	18·10
*Beef Extract	8·52
*Brown Bean Powder	4·52
*Beef Powder	4·52
Beef Fat	4·52
*Yeatex Powder	4·52
Onion Powder	4·52
M.S.G.	2·26
*Protex No. 5 Powder	2·26
Ground Thyme	0·23
Caramel	0·23
Ground White Pepper	0·12
Ground Paprika	0·12
Ground Coriander	0·12
Ground Bay	0·12
ICI Edicol Supra Orange AG.	0·12
	100·00

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Use 4-ply laminated soup pockets, fill 44 g. of mix into each and heat seal.

Reconstitution

Mix the contents of a packet with 1 pint of cold water, bring to the boil and simmer for 3–5 minutes before serving.

CREAM OF CHICKEN SOUP MIX

	Per cent
Dehydrated Chicken Meat	28·25
*Wheat Flour	24·60
*Skim Milk Powder	22·70
*Chicken Fat	18·20
Salt	3·55
M.S.G.	1·13
*Onion Powder	0·57
*Protex C.S.C. Powder	0·55
Sugar	0·38
Saromex White Pepper (on salt)	0·04
Saromex Celery (on salt)	0·03
	100·00

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Fill 91 g. of the mix into each 4-ply laminated soup pocket and seal.

Reconstitution

Mix the contents of a packet with 1 pint of cold water, bring to the boil and simmer for 10–15 minutes.

CREAM OF ONION SOUP MIX

	Per cent
Edible Fat	28·70
*Wheat Flour	18·61
Dried Onion Pieces	12·52
*Skim Milk Powder	12·52
*Cornflour	12·52
*Salt	8·75
*Onion Powder	3·75
M.S.G.	1·25
*Protex No. 5 Powder	1·25
Ground White Pepper	0·13
	100·00

Method

Mix all the ingredients thoroughly. If desired, the ingredients marked * may be pre-dried together to lower the final moisture content.

Packaging

Fill 79 g. of the mix into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Mix the contents of a packet with 1 pint of cold water, bring to the boil and simmer until the onion pieces are tender.

FRENCH ONION SOUP MIX

	Per cent
Cornflour	55·36
Salt	26·50
Protex No. 5 Powder	11·75
M.S.G.	5·85
Colouring	0·36
Ground White Pepper	0·18
	100·00

Method

Mix all the ingredients thoroughly.

Packaging

Fill 32 g. of the dried base with 20 g. of dehydrated kibbled onion pieces into each 4-ply laminated soup pocket and seal.

Reconstitution

Mix the contents of a packet with 1½ pints of cold water, bring to the boil and simmer for 10–15 minutes.

CHESSWOOD
BRAND
MUSHROOM SOUP
3 Servings

(*By courtesy The Metal Box Co. Ltd.*)

A typical British soup mix packaged in a Tripolam X.1 pocket. This pack is a lamination of foil/paper/foil, plus an inner, heatseal coating.

TOMATO-VEGETABLE SOUP MIX

		Per cent
Salt		9·876
Tomato-Paprika Flake		
	Per cent	
Tomato Solids	64·985	
Wheat Starch	17·730	
Paprika	12·410	
Locust Bean Gum	0·861	
Calcium Oxide	0·261	
Moisture	3·753	
	100·000	9·176
Sugar		8·113
Fat		6·349
Potato Flour		5·009
Protex No. 5 Powder		3·668
Potato Starch		2·963
M.S.G.		2·822
Corn Starch		1·905
Spice Mix		
	Per cent	
Salt	59·05	
Celery Leaf	23·81	
Black Pepper	7·14	
Onion Powder	4·76	
Garlic Powder	2·86	
Rosemary	2·38	
	100·00	1·481
Dried Vegetables		
	Per cent	
Carrots	45·275	
Onions	22·637	
Red Peppers	7·583	
Green Peppers	7·582	
Cabbage	11·429	
Celery	5·494	
	100·000	6·420
Noodles		42·218
		100·000

Method

Mix all the ingredients thoroughly in a ribbon-type mixer.

Packaging

Fill 70 g. into each 4-ply laminated soup pocket and heat seal.

Reconstitution

Mix the contents of one packet with $1\frac{3}{4}$ pints of water, simmer for 10 minutes and serve.

Elizabeth Lazenby's
CHEF
SPRING VEGETABLE SOUP
MUSHROOM SOUP
COCK-A-LEEKIE SOUP
ONION SOUP
CHICKEN NOODLE SOUP
MAKES 4-6 DELICIOUS SERVINGS

(*By courtesy The Metal Box Co. Ltd.*)

A typical range of British soup mix sachets.

MANUFACTURE

Once the formulation of a likeable soup mix has been achieved the manufacture of it on a large scale naturally follows. It is proposed to deal with this aspect under five headings, viz.: blending, packaging, quality control, noodles and development.

1. Blending

Dehydrated materials such as vegetables and meats will sometimes require to be broken down into smaller pieces prior to blending. This operation, and the prior-to-dehydration comminution, can be carried out in a comminuting mill. Constructed throughout in stainless steel, including a wide range of sieves, outputs of the order of 2,000–3,000 lb. per hour can be achieved in such a mill depending on the material. The grinding chamber is fitted with a rotor carrying sixteen swinging double-edged interchangeable hammer/cutter blades.

The order of ingredients for soup mix blending will depend in general on the type of mix, but usually the dry powdered ingredients are first blended in a large mixer of the "Artofex" type. The dehydrated vegetables or meats are then added and the whole thoroughly re-blended, followed by the fat, with more mixing. The fat is creamed or whipped before use in a mixer operating at high speed. The starchy ingredients are usually pre-dried and it is most essential to ensure that the total moisture content of the mix is low.

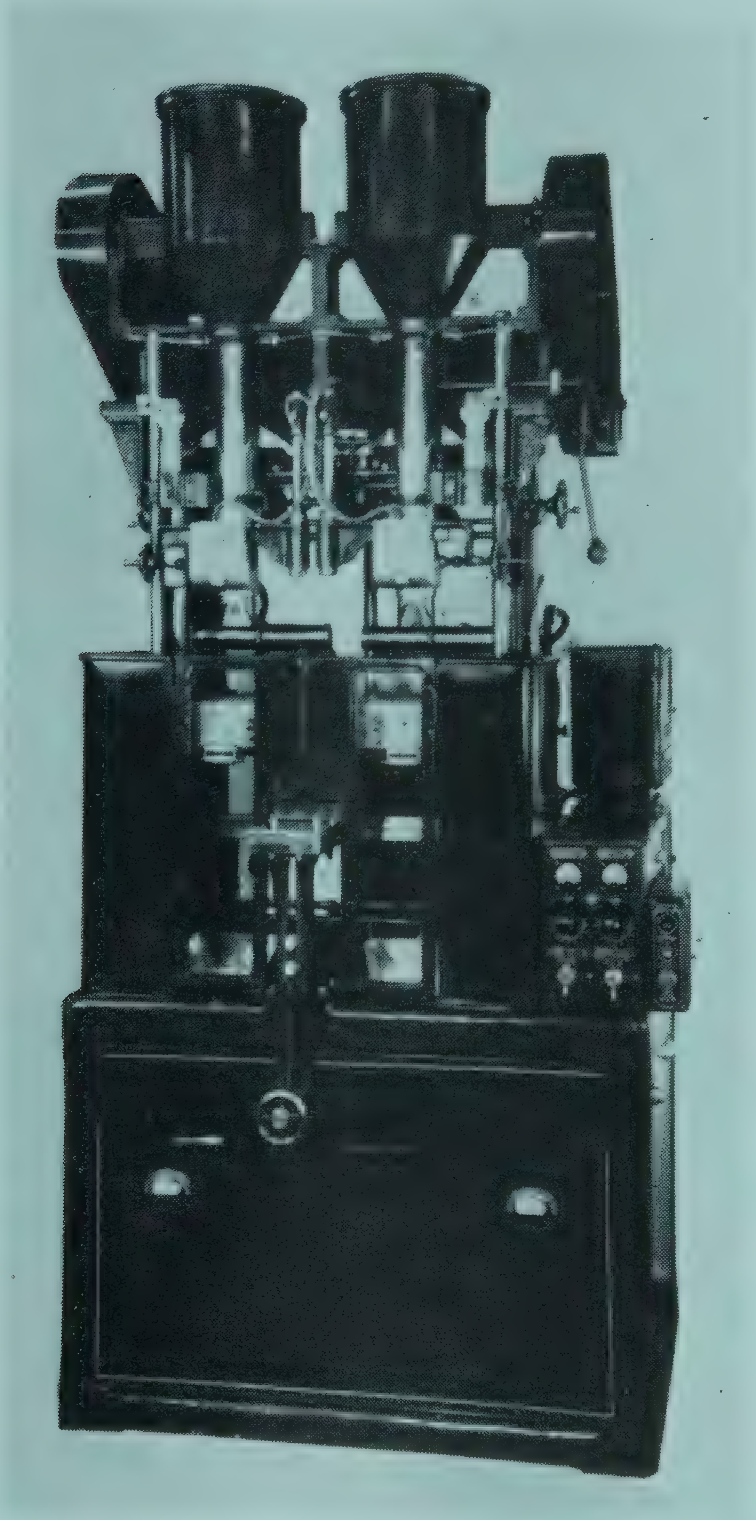
The batch weight is usually about 400–500 lb. and this will produce approximately 3,000–4,000 2-oz. packets of soup mix.

An interesting and ingenious application of electronic automatic sequence selection control has been installed by a large British manufacturer of soup mixes and is described in a trade journal.[11]

2. Packaging

The prepared blended mix or paste is filled volumetrically or by weight into laminated soup pockets or pouches. These pouches are made from a wide variety of materials but the best presentation is given by the acetate/aluminium foil/paper/polythene laminated pocket. The colour gravure is printed in reverse on the acetate layer and the effect is very good.

For the ultimate in soup mix protection the best type of pouch to use is the one made from aluminium foil/paper/aluminium foil with a heat-seal. This pouch is also cheaper than the other type.



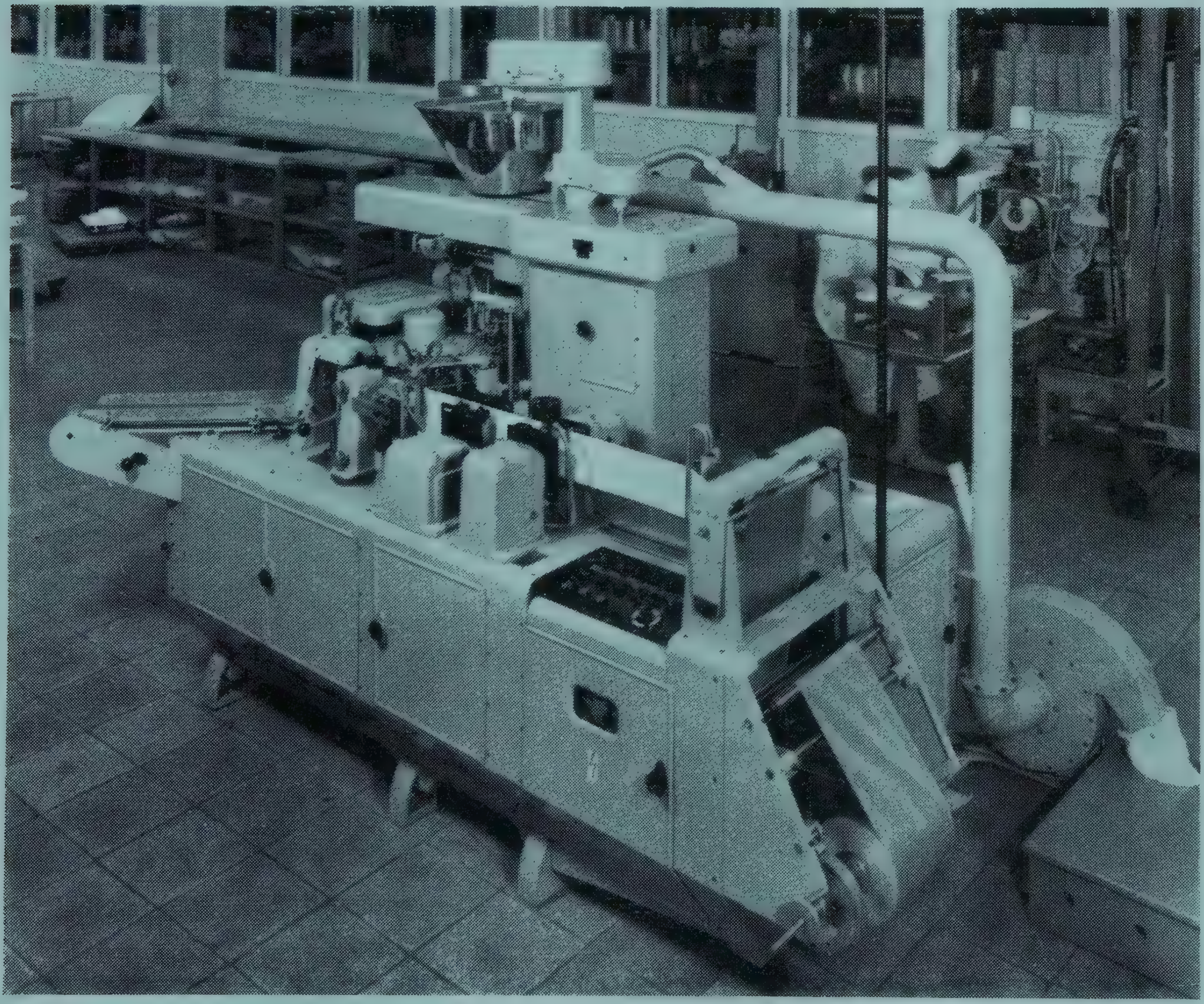
(*By courtesy Baker Perkins Ltd.*)

The Forgrove model 7A Transwrap Soup Mix Packaging Machine, with reel feed, automatic filling and sealing.

Heat sealing of the pouches is effected by mechanically operated electrically heated sealing jaws. The methods of filling and sealing naturally vary within the soup mix industry as some firms use fully automatic forming and sealing of printed stock on the reel whereas others rely on semi-automatic filling of separate pouches serviced by operators.

Powdered soup mixes and those containing "piece" ingredients can be successfully packaged by the Forgrove 7A Transwrap machines with power and volumetric feed heads respectively. The machine forms packages from the reel (pillow or fin-seal types), measures the soup mix, fills, seals and cuts off the package and finally delivers the packages at a convenient height for carton packing. The twin production heads permit output speeds of the order of 60 packages/minute.

If noodles are used in the soup mix they are added separately to the pouch and, in this case, it is more than ever necessary to use a pouch that will not suffer from "noodle puncture" during storage and transit. The paste ingredient of chicken noodle soup, due to its special consistency, is normally filled by special machinery.



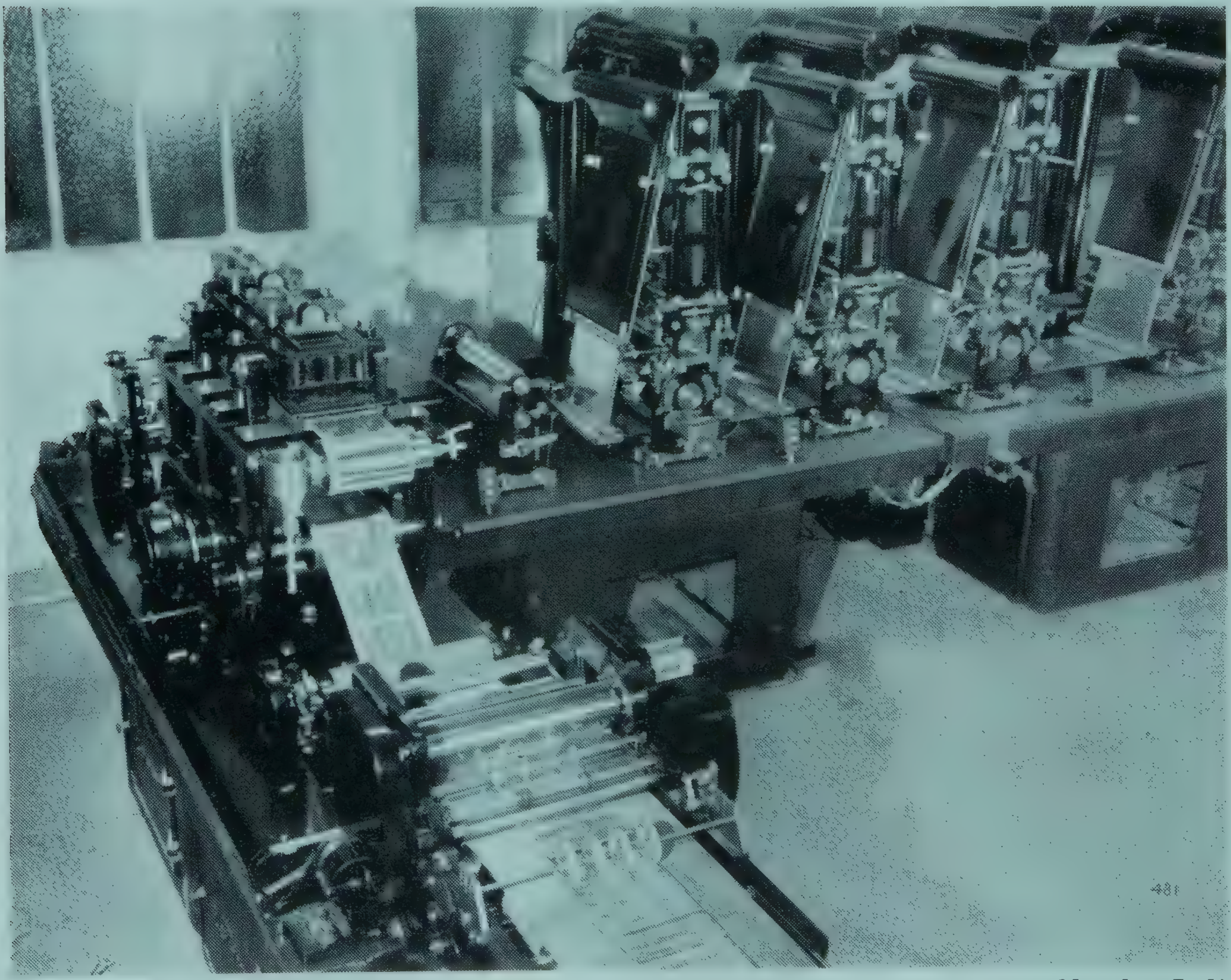
(By courtesy Ivers Lee Ltd.)

The latest Höller Soup Mix Packaging Machine, which forms sachets from printed stock and automatically fills at up to 12,000 packs per hour.

Soup mixes can be packaged in more traditional packs, especially if they are to be used by large consumers. For example, the "Skey" can (The Metal Box Co. Ltd.) is ideal for the purpose of gas-packaging[12] and thus a long storage life can be obtained. Ordinary sanitary cans of larger size (A $2\frac{1}{2}$, A 10, etc.) can also be used for gas packaging and certain types of mixes are suitable for packaging in screw-capped glass jars.

3. Quality Control

Apart from the raw material evaluation dealt with in an earlier part of this article, quality control should also include: constant reconstitution checks on the finished product, weight checks on the filled pouches, accelerated storage tests to determine probable shelf-life (by high temperature incubation), bacteriological checks on the finished products (by colony count techniques), tests of the efficiency of heat-sealing and bursting strength tests of the laminated pouches.



(By courtesy Chambon Ltd.)

The new Chambon high-speed Sachet-making Machine for soup mixes. Capable of printing, forming and sealing 20,000 sachets per hour.

The storage tests should also be carried out at room temperature under varying conditions of humidity, and the palatability of the reconstituted soups should be accompanied by peroxide value determinations on the fat in the soups, as well as acid value tests on the fat content to determine deterioration by fatty acid formation. During storage the permeability of the pouches should be carried out by moisture pick-up tests. These can be followed by weight/package increase or by actual moisture estimation using the Karl Fischer reagent.

To get an idea of storage life the soup mixes in sachets can be stored in an incubator at 77° F. and 75 per cent relative humidity for three months which will be approximately equivalent to at least six months under temperate climatic conditions.

Knorr
MINESTRONE
ITALIAN
VEGETABLE SOUP
Knorr
HAM FLAVOURED
GREEN PEA
SOUP
SPECIAL TREAT
The Famous
Knorr Tomato Recipe!
Knorr
TOMATO
SOUP
Knorr
ASPARAGUS
SOUP
FLORIDA
SPRING VEGETABLE
SOUP
Knorr
MUSHROOM
SOUP
Knorr
LEEK
SOUP
Knorr
OXTAIL
SOUP

(By courtesy The Metal Box Co. Ltd.)

A range of British soup mixes packaged in pockets made from laminated foil/paper/Pliofilm.

HEINZ SOUP Onion French Style
HEINZ SOUP Mushroom
HEINZ SOUP Chicken Noodle
HEINZ SOUP Clear Vegetable
HEINZ SOUP Pea with ham
HEINZ SOUP Chicken
UP TO 6 SERVINGS

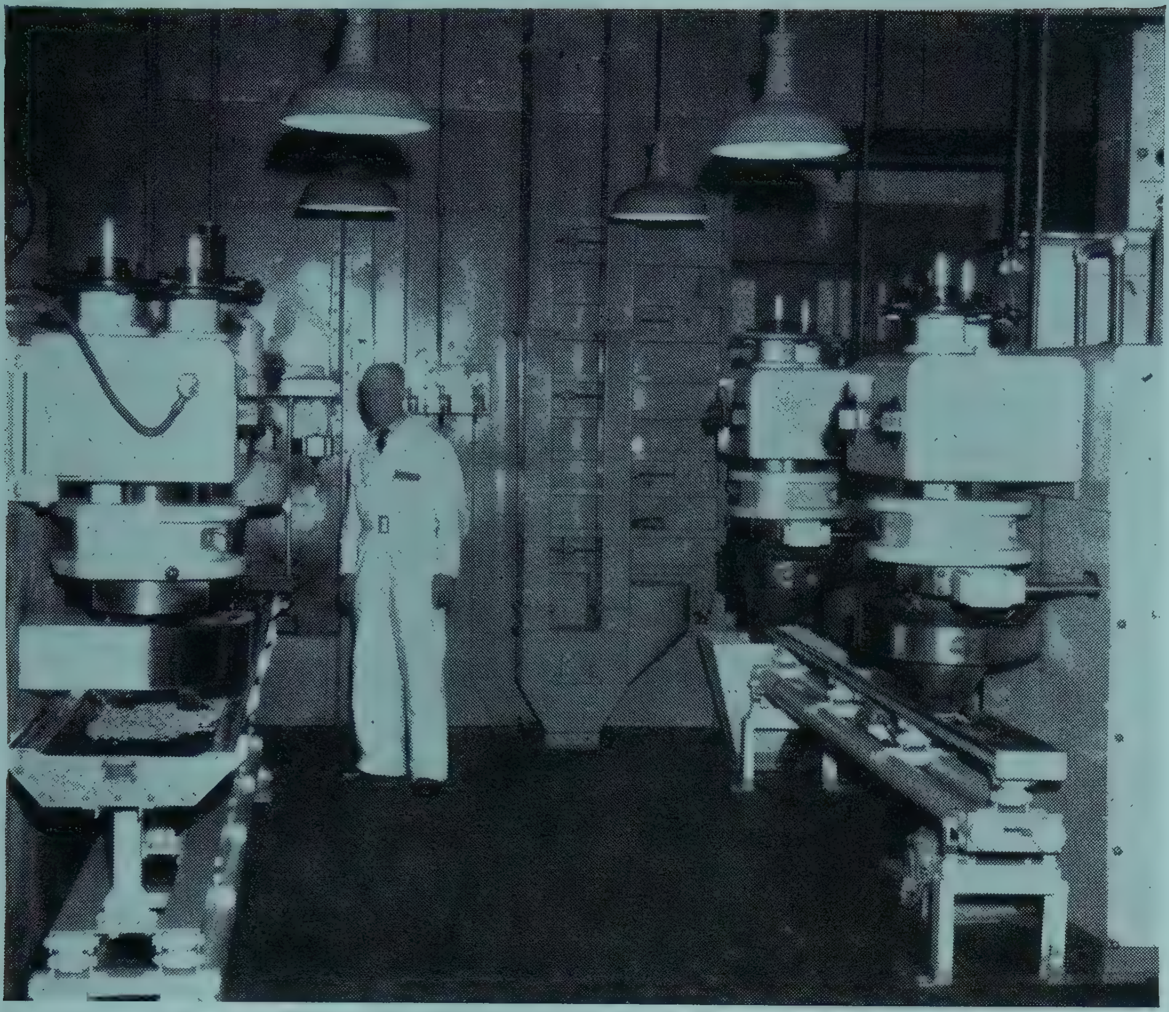
An attractive new range of soup mix sachets.

4. Noodles

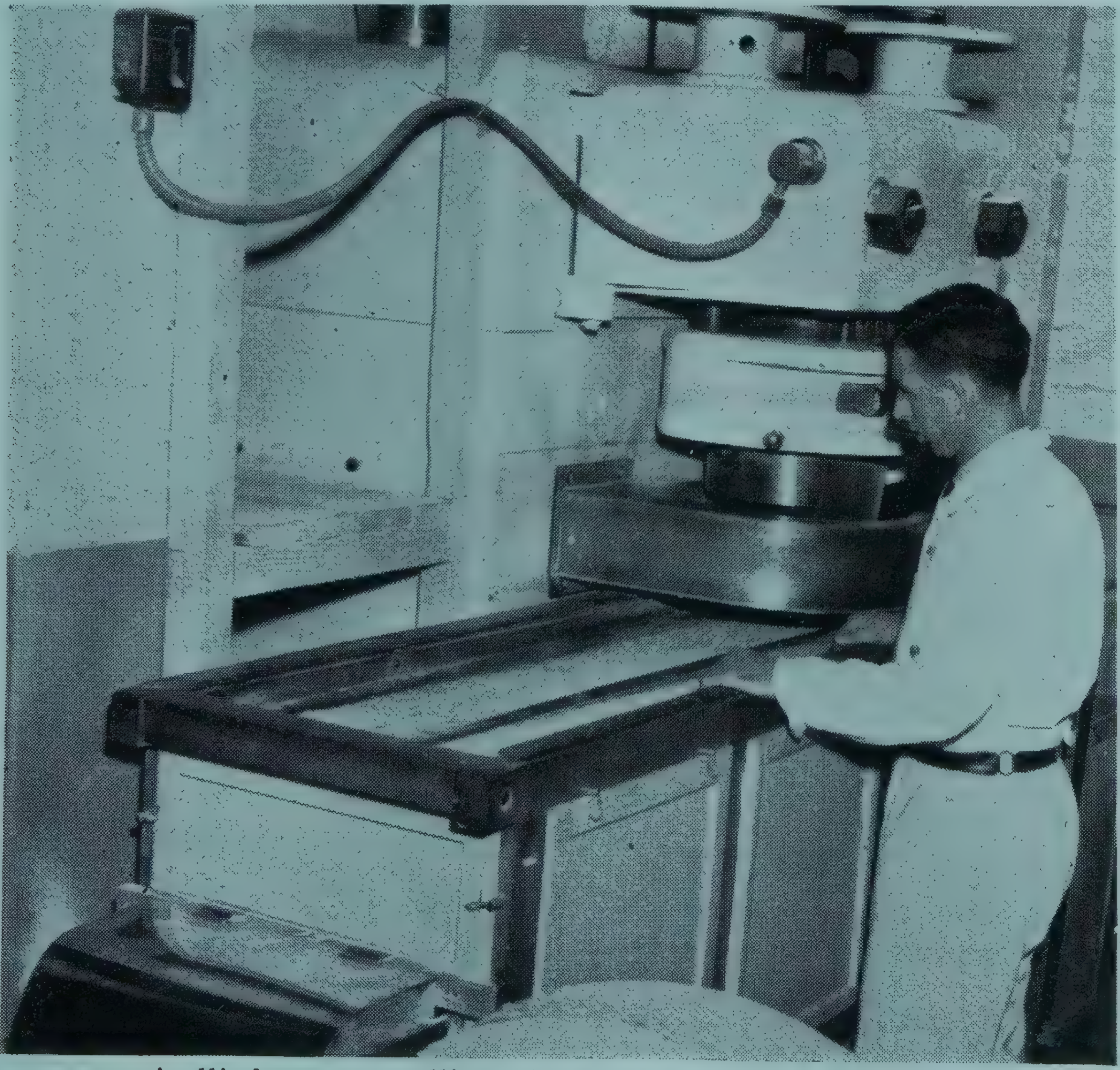
Noodles at one time were always manufactured from a sheet of dough, the sheet being continually passed through rollers until the required thickness was obtained; it was then cut into thin strips. These were cut noodles and, even today, are considered by many people to be the best of their kind.

The manufacture of cut noodles is, of necessity, a batch process whereas today's requirement is for continuous production. This can only be carried out on a continuous working extrusion press. On this type of machine the requisite amounts of semolina and water—mechanically controlled—are automatically fed to the inbuilt mixers which feed the mass into the extrusion worm. Here the dough is compacted, forced through a pressure chamber and then through a die. The size of the finished noodles is controlled by the size of the slots in the die and these can be chosen to suit individual requirements.

On leaving the extruder, the noodles must be very carefully dried in order to ensure that "checking" and subsequent cracking does not occur. A small paste goods press can produce 1½–2 cwt. of noodles per hour according to the size and shape required. Drying, however, takes quite a considerable time, from, say, eight hours up to twenty hours; here again, depending



A battery of Buhler Noodle Extrusion Presses installed in a British Factory.



Short-cut vermicelli shown travelling along the pre-drier after extrusion from the Buhler Press.

on the type of dryer and the facilities available. For relatively small quantities, static dryers can be used very successfully but, for larger production, continuous dryers, fitted with climatic control, are considered to be the most satisfactory.

FIOR DI POMODORO
PURO ESTRATTO ABOSTO
CALISTO FRANZI & FIGLI

A capsule type of pack suitable for tubed soups.

5. DEVELOPMENT

The soup mix market, both domestic and export, is open for the development of many kinds of soups and allied products.

One of the latest developments in the dehydration field is the accelerated freeze drying process developed by the Ministry of Agriculture, Fisheries and Food Experimental Factory staff at Aberdeen. This process makes use of the principles of sublimation of ice directly into water vapour, whereby frozen (raw or cooked) foods can be dehydrated *in vacuo*, with heat applied, to give materials which will reconstitute very rapidly into foods which look very similar to the original materials. Thus it is possible to obtain dehydrated chops, steaks, fruits and vegetables of superior texture, colour and flavour. This process, requiring a fairly heavy capital investment, is available for commercial exploitation in this country and it would appear that superior type "instant" food mixes, containing discrete forms of meat and vegetables, will be on the market in the not too distant future.

Products which may also be briefly considered are gravy and sauce mixes. These are now being marketed with the traditional flour base and also with a pre-cooked starch base which leads to rapid reconstitution to give an "instant" product. Many variations of these products may be evolved such as brown gravy, parsley sauce, onion sauce, white sauce, etc. Bases for the many types of salad dressings may also be formulated and packaged in the same manner as soup mixes.

REFERENCES

1. Rolfe, E. J., *Food Trade Review*, *24*, No. 8, 12 (1954).
2. Joslyn, M. & Heid, J. L. *Western Canner & Packer*, 29 (1957).
3. McComb, E. A. & McCready, R. M., *J.A.O.A.C.*, *35*, 437 (1952).
4. Monier-Williams, G. W., *Analyst*, *52*, 343, 415 (1927).
5. *Publication AIC-168*, Western Regional Research Lab., Calif., U.S.A.
6. Vaughn, R. H., *Food Research*, *16*, 429 (1951).
7. Lea, C. H., *Chem. & Ind.*, 1303 (1953).
8. *Statutory Instrument No. 1066* (1957).
9. *Naarden News*, 41 (1955).
10. *Brit. Food J.*, *57*, 57 (1955).
11. *Food Trade Review*, *28*, No. 6, 11 (1958).
12. Devey, J. D., *Food Manuf.*, *28*, 352 (1953).

CHAPTER VIII

CONDENSED SOUPS

AN increasing number of condensed soups are now being marketed in the United Kingdom and it seems likely that this type of product will continue to increase in volume of production. Condensed soups are not new as they were manufactured many years before the last war. The term "condensed" is something of a misnomer as the soups are not literally condensed—they are made with less water so that an equivalent volume of water should be used when heating for serving.

Condensed soups are attractive for two main reasons:

1. Normally they are packed in A 1 cans containing 10–11 oz. of soup, which gives one pint of soup for the table. The smaller can size is economical in tinplate, labels and carriage space and some of these savings are passed on to the consumer in lower prices.
2. Being in a concentrated form they can be used undiluted for sauces or as ingredients in many savoury dishes.

It should be remembered by the manufacturer that the Code of Practice for Canned Soups should be followed to allow for double the main ingredients so that the regulation concentrations are present on dilution for serving.

Since condensed soups are much more viscous than ordinary canned soups the processing conditions are more severe. Examples are as follows:

Condensed Cream of Tomato Soup

A 1 cans	60 minutes at 240° F.
No. 1 Tall cans	70 minutes at 240° F.

Other Condensed Soups

A 1 cans	80 minutes at 240° F.
No. 1 Tall cans	90 minutes at 240° F.

The soups should, of course, be filled at a temperature of not less than 160° F.

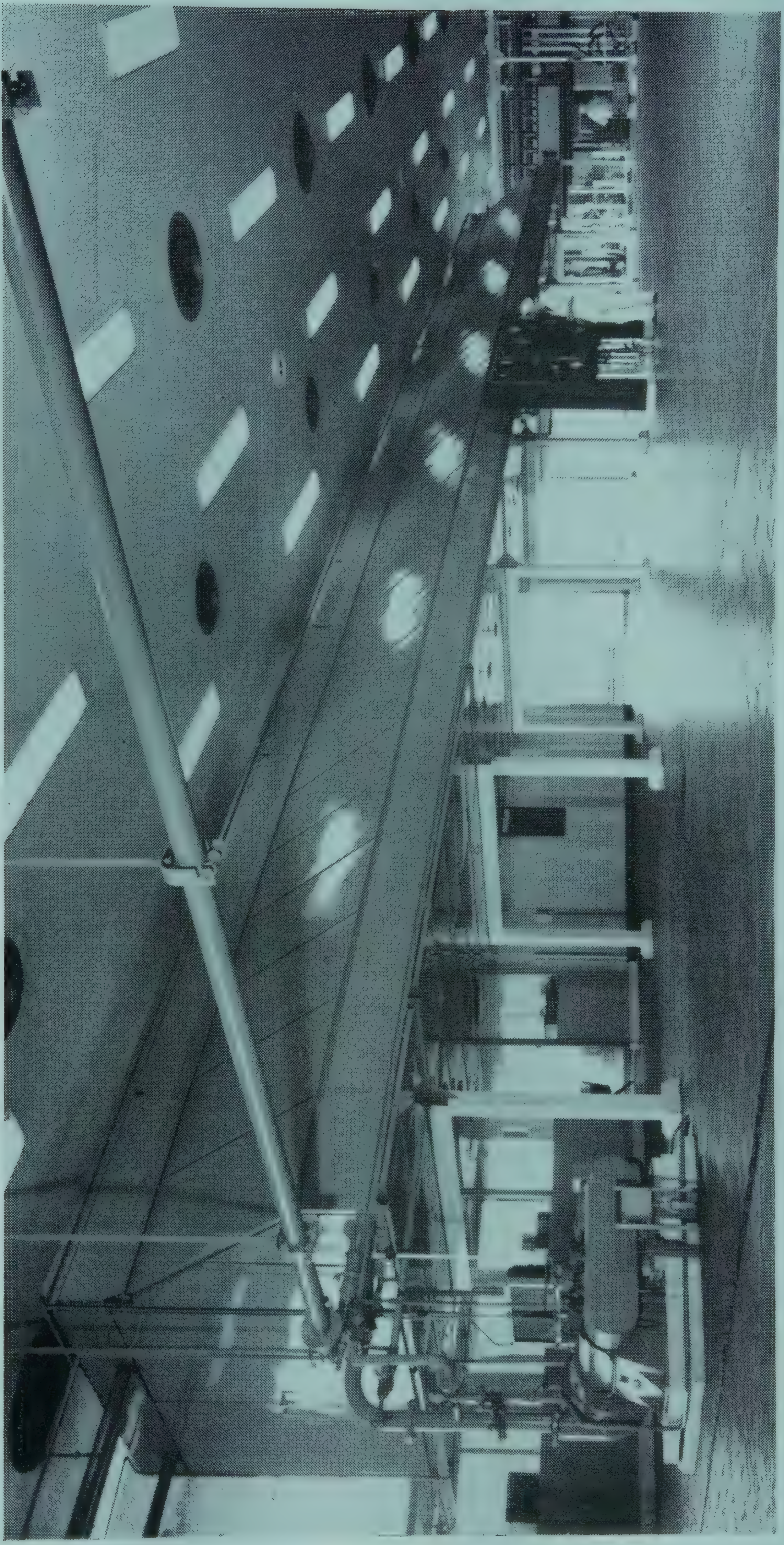
CANNED CONDENSED CREAM OF TOMATO SOUP

Tomato Purée (30 per cent solids)	76 lb
Sugar	20½ ,,
Skim Milk Powder	19½ ,,
Butter	15 ,,
Cornflour	6½ ,,
Salt	4½ ,,
Protex No. 8	11 oz.
M.S.G.	11 ,,
Saromex Onion (on salt)	8½ ,,
Saromex Garlic (on salt)	1½ ,,
Saromex Pepper (on salt)	¾ ,,
Sodium Bicarbonate	Sufficient to adjust finished soup to pH 4·6–4·7

Bulk to 30 gallons with water.

Bulk to volume and whisk vigorously in a stainless steel steam-heated pan, fitted with a stirrer. Bring to the boil and simmer for 5 minutes. Homogenize at 1,500–2,000 p.s.i. and 180° F. and fill into plain A 1 cans at 200° F. Seal and process at 240° F. for 1 hour and water cool. The pH of the processed soup should be 4·6–4·7.

N.B.—Before serving, an equivalent volume of water should be added to the contents of each can. The soup can also be used, undiluted, as a sauce or base.



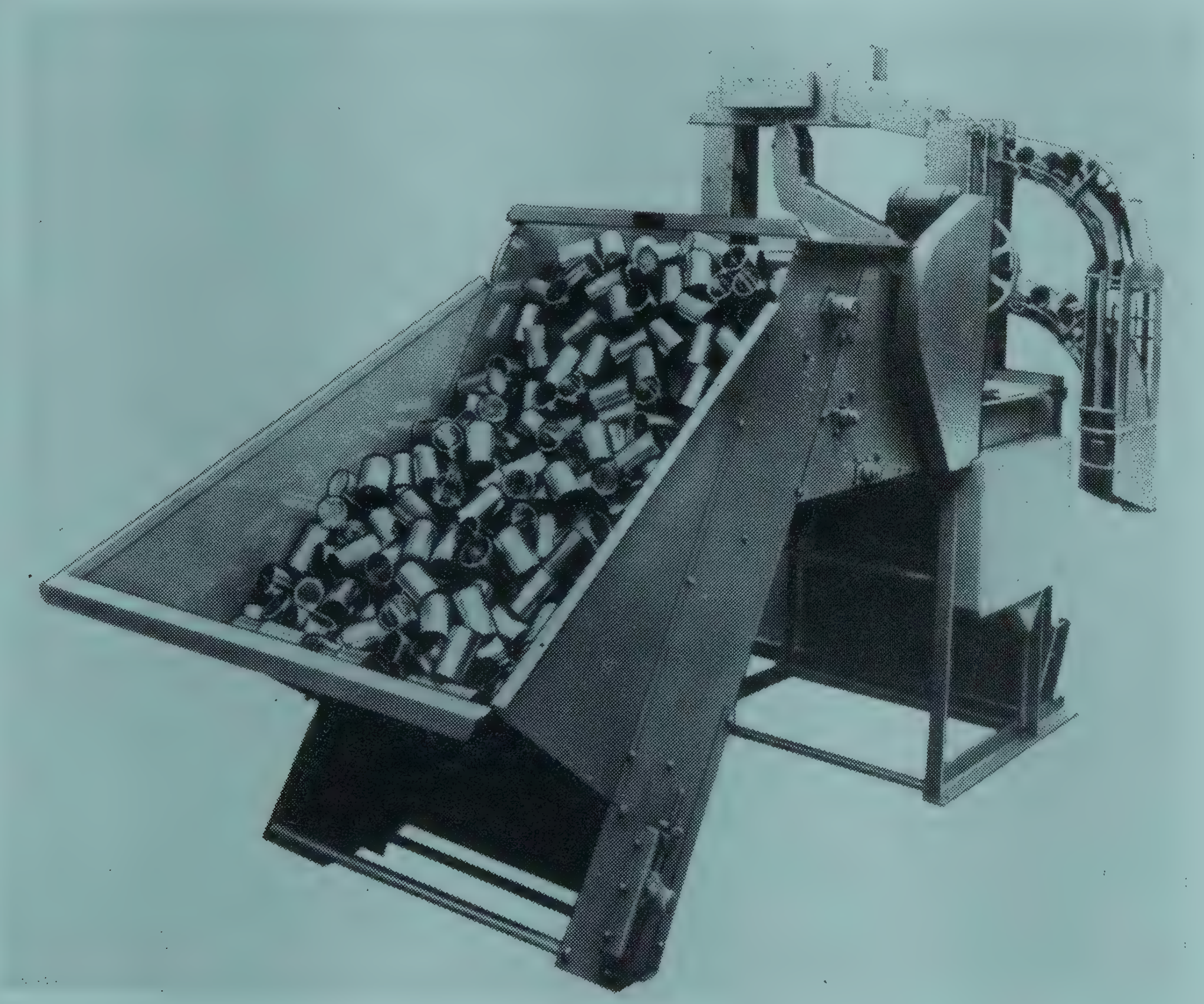
Showing the general arrangement of a Continuous Pipe Blanching Unit which is completely enclosed by removable covers. Note the operator at the centrally situated temperature control panel.

CANNED CONDENSED VEGETABLE SOUP

Carrots (diced)	47	lb.
Onions (rings)	34½	,,
Tomato Purée (30 per cent solids)	18	,,
Dried Peas (soaked)	15½	,,
Wheat Flour	12½	,,
Potatoes or Swedes (diced)	9½	,,
Dried Beans (soaked)	9½	,,
Noodles (alphabet)	8	,,
Sugar	4½	,,
Salt	4	,,
M.S.G.	1¼	,,
Protex C.S.C.	1	,,
Saromex Garlic (on salt)	2	oz.
Ground White Pepper	1¼	,,

Bulk to 30 gallons with water.

Mix the dry ingredients with water to form a smooth paste, then add the prepared vegetables, etc., and bulk to 30 gallons



(By courtesy The Metal Box Co. Ltd.)

Feeding end of the MB Empty Can Unscrambler designed to handle tall processed food cans. The cans may be fed from cartons or MB cages, and the machine will handle 450 cans per minute delivering in correct order on to one runway or cable conveyor.

with water. Bring to the boil and simmer for 5 minutes, with stirring. Fill hot into A 1 plain cans, seal, and process for 80 minutes at 240° F. Water cool.

N.B.—Before serving, an equivalent volume of water should be added to the contents of each can. The soup can also be used, undiluted, as a sauce or base.

CANNED CONDENSED OXTAIL SOUP

	Oxtail Meat	36	lb.	
OR	Beef	29	,,	
	Oxtail (with bone)	7	,,	
	Onions	22½	,,	
	Carrots	22½	,,	
	Wheat Flour	21	,,	
	Salt	4½	,,	
	Yeatex	2½	,,	
	M.S.G.	1	,,	13 oz.
	Protex Standard	1	,,	13 ,,
	Caramel	½	,,	
	Paprika	¾	,,	
	Ground White Pepper	½	,,	
	Whole Bay Leaves	¼	,,	
	Ground Thyme	¼	,,	
	Ground Coriander	¼	,,	

Bulk to 30 gallons with beef bone stock.

Cook the prepared chopped vegetables, with bay leaves until tender. Remove bay leaves and purée the vegetables. Mix the other ingredients, except meat, with cold water to form a smooth paste. Bulk with purée and beef bone stock to 30 gallons. Remove the oxtail meat from the bones and dice with beef, if used. Use the oxtail bones for stock also. Bring the soup to the boil and simmer for 5 minutes. Fill hot into A 1 plain cans containing raw meat, seal and process for 80 minutes at 240° F. Water cool.

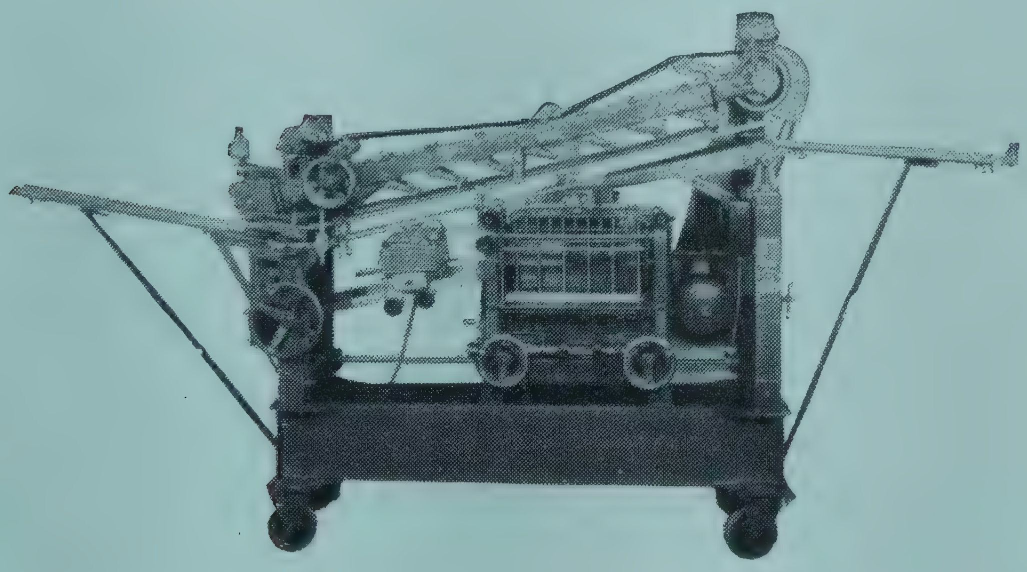
N.B.—Before serving, an equivalent volume of water should be added to the contents of each can. The soup can also be used, undiluted, as a sauce or base.

CANNED CONDENSED CREAM OF CHICKEN SOUP

Milk	16 gals.
Wheat Flour	16 lb.
Butter	14 ,,
Amioca	10½ ,,
Salt	3 ,, 5 oz.
Protex No. 8	1 ,, 2 ,,
M.S.G.	13 oz.
Onion Powder	13 ,,
Sugar	9 ,,
Saromex Celery (on salt)	5½ ,,
Ground White Pepper	1 ,,

Bulk to 30 gallons with chicken stock.

Cover dressed chickens and giblets with water and retort until the flesh comes away easily from the bones. Drain off liquor and retain for stock. Remove flesh from bones and use diced as a garnish. Digest the bones, skin and giblets in water for 1 hour at 250° F. in a retort. Drain and add the liquor to the original liquor. This is the chicken stock. Whisk the flour and starch with the milk to a smooth paste and add to the rest of the ingredients which have been brought to the boil in a stainless steel steam-heated jacketed pan, equipped with a stirrer. Homogenize at 1,500–2,000 p.s.i. and hold at 180°–

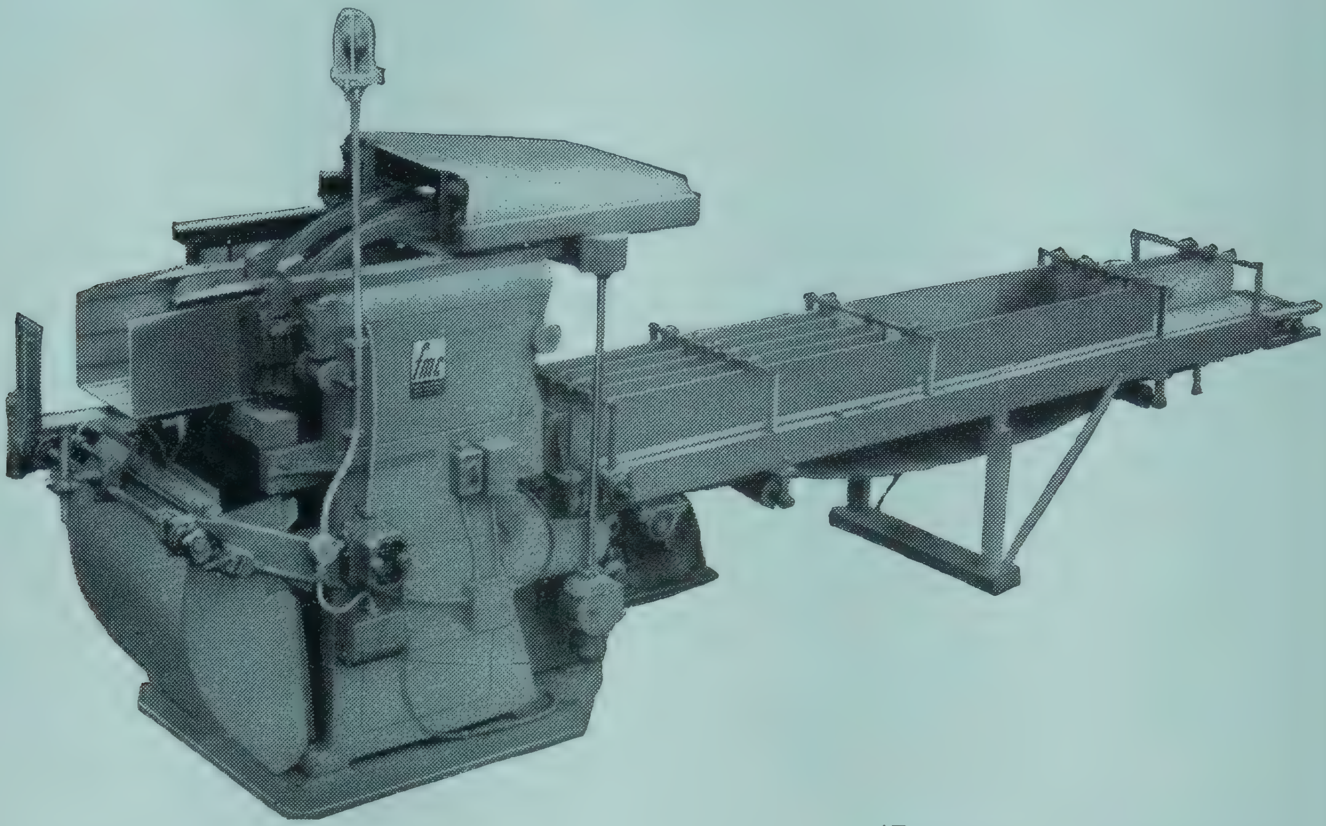


(*By courtesy The Purdy Machinery Co. Ltd.*)

The "New-Way" heavy duty Can Labelling Machine, which will handle 50 to 500 or more cans per minute.

200° F. prior to filling. Place 1 oz. of diced chicken meat in each plain A 1 can and fill with soup. Process, after sealing, for 80 minutes at 240° F. and water cool.

N.B.—Before serving, an equivalent volume of water should be added to the contents of each can. The soup can also be used, undiluted, as a sauce or base.



(By courtesy Varley-FMC Ltd.)

The FMC automatic high-speed non-shock Can Casing Machine. Capacity up to 1,200 cases per hour in 3 by 4 or 4 by 6 packs.

"Cona" Instant Soup Heater

The new Instant Soup Heater produced by "Cona" Ltd., designed to heat 8 oz. individual portion cans of ready-to-serve soup in a little under one minute. Because the soup is heated in the can it may be poured straight from the can into the serving bowl. A quick, easy method of serving soup, this will be particularly useful in busy snack-bars. Also, it is clean and hygienic because the soup, being heated in the can, at no time comes into contact with the heating equipment.

CONA
Campbell's
TOMATO SOUP
CHICKEN SOUP
VEGETABLE SOUP
GREEN PEA SOUP
CELERY SOUP

CHAPTER IX

FUTURE DEVELOPMENTS IN THE SOUP INDUSTRY

ON the face of it, as things stand at the moment, it would appear that the use of quick-freezing offers the greatest opportunity for the development of quality in ready-to-use soups. Indeed, if the frozen food industry as a whole and in particular that part of it which deals with pre-cooked foods of all kinds, continues to grow, and these foods are accepted by the public for everyday use, quick-frozen soups may become very popular indeed.

In spite of what may or may not happen in the frozen food industry, there is still no doubt that soup is something that the housewife likes to have by her and unless she has a low-temperature refrigerator of considerable size, she will never be able to carry more than a limited range of speciality frozen food. In any case, it will be very many years before every house in the country has a refrigerator as a matter of course, and even many more years before these are all equipped with low-temperature holding space of sufficient size to hold a decent-sized range of frozen foods. It is obvious therefore that if improvements can be made to either canned or dried soup products, these will be acceptable to the average housewife and perhaps even to those who, because of high quality, have changed to the use of the frozen product.

In the sphere of canning, it would seem that the most likely developments are first, the use of high-temperature flash sterilization, followed by aseptic filling and closing, and second, but some way off yet, the use of antibiotics.

The basic idea behind flash pasteurizing and thus flash sterilization, is that cooking is a function of time as well as temperature. Thus, for example, if you could heat up a piece of raw meat to say 300° F. and then cool it again in the space of a second, it would not appear to be cooked at all, even though it has been raised to cooking temperature throughout its mass.

Flash pasteurization, as opposed to flash sterilization, was first introduced into the milk industry as a means of pasteurizing milk quickly, without too much loss of flavour. Thus, instead of heating the milk up in bulk, which of course means heating it comparatively slowly, to the temperature required for pasteurization, it was pumped through narrow-gauge jacketed pipes in such a manner that it was first heated and then cooled quickly. Of course the rapid heating and cooling in this method depends upon the small volume of liquid to be heated in relation to the heating surface.

The original flash pasteurization method has now been developed so that a much higher temperature can be used on the heating surfaces and therefore the job is done in much quicker time. This improvement has been made by the use of better methods of spreading the milk into a thinner layer for quicker heating, better control instruments and so on. This process of very rapid heating and cooling in an enclosed heat exchanger is known as H.T.S.T. (High Temperature—Short Time) and it is now applied to all kinds of liquid food which has to be pasteurized before bottling or canning, including such items as fruit juice, tomato juice and so on.

In the case of tomato juice the temperature required is above that of boiling water and in fact with this product we come to the first stage of flash sterilization, as against ordinary pasteurization. The treatment of tomato juice by H.T.S.T. however is not quite true flash sterilization because after heat treatment, the juice is just sufficiently acid to tolerate filling and capping under ordinary atmospheric conditions without serious risk of contamination provided that reasonable sanitary precautions are taken. Tomato juice which has been properly heat treated and cooled before filling and canning may be cooled right off in the cans and labelled without further heat treatment in the can and is of course much superior to juice which has been heated slowly in the can in a conventional canning retort.

Obviously, once a liquid product is heated to above the temperature of boiling water in a tubular or plate type heat exchanger, many new problems arise. For example, the rate of flow of the product has to be increased to prevent burning on to the heating surfaces and also, of course, the product itself develops a pressure within the pipes. Thus, it is no longer possible to pump the liquid straight through both heating and cooling sections of the heat exchanger, but check valves must be introduced between the heating and cooling sections.

So far, the H.T.S.T. method of true sterilization has not been applied to soup on any very large scale, but it has been done experimentally and the advantages of heating and cooling the soup in a fraction of the time taken in cans in the retort are obvious, both from a culinary and economic point of view. The main points to be considered in developing this system are firstly that it is necessary to pass some small solids through the apparatus with the liquid, if the system is to be applied to a wide range of soups, and secondly, that unlike tomato juice, soup is not sufficiently acid to make it safe to fill and cap under ordinary atmospheric conditions. If, therefore, full advantage is to be taken of rapid sterilization in the heat exchanger, to eliminate in-can heating, then some means must be devised to fill and cap the can aseptically.

The problem of passing solids as well as liquids through the heat exchanger is not a serious one and it is in fact done in the tubular type of blancher sometimes used for peas or beans. In this case, all that is required is a special type of pump which will pass the solids without undue "mashing". It is, however, necessary and unavoidable, to use a wider bore heat exchange tube where solids have to be passed, and of course this in turn will slow up the rate of heating and cooling and reduce the beneficial effects of the process. Even so, with all reasonable sized pieces of solid, there is no doubt that the system has great advantages.

At this stage, it may perhaps be mentioned that a possible further improvement upon this system may be brought about by the use of dielectric heat as opposed to steam heat. This system of heating has been applied to liquids flowing through tubes by the very simple method of placing electrodes on either side of the tube, or rather curved around it. If dielectric heating were used to heat liquid soup, with solids suspended in it, then the problem of the thickness of the layer of soup and solids would not be so critical, as heat would of course be generated evenly throughout the mass, provided of course that the dielectric factors of all the various component parts of the mixture are about the same.

The provision of means of filling and capping the cans aseptically, that is, in such a manner that there is no possible chance that bacteria or moulds get into the soup or can, and the can and lid are also sterile, is of course not so simple.

Experimental aseptic-filling and can-sealing lines have been devised and used for experimental operation and provided that sufficient capital is available to build the necessary machines, there seems to be no reason why commercial plant should not be made. One type of machine used consists of a standard filler, which has a totally enclosed feed hopper, together with a standard can-closing machine of the automatic stationary can type. Both filler and seamer have the can tracks and operating heads totally enclosed in steel trunking, which is in turn connected to a tunnel covering the empty can feed. The whole trunking design is such that once the empty cans are fed in on the conveyor, they travel in a continuous tunnel right through the filling and sealing operations. Live, superheated steam is then fed into the trunking and allowed to escape from the ends at which the cans are fed or delivered. Thus, the inside of the tunnel is constantly filled with steam and conditions are therefore sterile. The constant escape of steam prevents air or bacteria entering and of course the steam sterilizes the incoming empty cans. A special steam jet is arranged to play upon the can ends before they are seamed on to the cans.

By means of the device described above, the partly cooled soup from the heat exchanger flash sterilizer can be filled into sterile cans and the cans sealed without danger of bacteriological contamination. The cans are then cooled and labelled.

As will be seen, the system described has many advantages apart from the fact that better soups could be produced in this manner. The plant is streamlined and continuous in operation and apart from first cost, more economical to run. Undoubtedly something on these lines will be in commercial operation in the not-so-far-distant future, and as a matter of interest, also, it may be pointed out that a similar device could probably be used for the production of very high-grade canned garden peas.

The use of antibiotics in canning is in its early stages of development although small-scale pilot plant experiments have been carried out with the preservation of vegetables by this method. It seems possible that eventual uses of antibiotics for use in foods will supplement existing methods of processing.

When using antibiotics one has to be very careful since there may be the possibility of traces left in the foods, thus leading to ingestion and alteration of susceptibility of the person to pathogenic organisms.

One of the most recent lines of food research being pursued in many parts of the world at the present time is the use of ionizing radiations. Again, it is possible that the use of radiations of this kind, which can alone sterilize food, will be confined to supplementing existing processes since many changes in flavour take place when foods are irradiated.

A new type of soup product appeared on the British market for the first time at the end of 1959. This was an instant cream of tomato soup and one of the Authors (J. D. D.) had the pleasure of developing it. The product is packed in an aluminium collapsible tube and it is a hot-filled product which depends for its keeping properties on the high solids and low pH of the paste. Since no discrete particles are present and since it is pre-cooked, the soup is literally instant and presents a completely new approach to soup packaging.

In 1959 quick-frozen meals in plastic pouches were marketed in this country and it is possible that soups will also be packaged in this manner. In this form of pack the contents are heated while still in the pouch, in a pan of boiling water, and thus can be served straight from the pouch, with no messy pans to clean afterwards.

BIBLIOGRAPHY

[1] Baumgartner, J. G., and Hersom, A. C., *Canned Foods—An Introduction to their Microbiology*, Churchill, London, 1956.

[2] Desrosier, N. W., *The Technology of Food Preservation*, Avi, U.S.A., 1959 (London: Food Trade Review Ltd.).

[3] Smith, H., *The Master Book of Soups*, Spring Books, London.

[4] Warren, G. C. (Editor), *The Foods We Eat*, Cassell, London, 1958.

USEFUL TABLES AND DATA

IN connection with the manufacture and canning of soups, reference is frequently necessary to tables of information as to strengths of various solutions, quantities, measures and conversions. Accordingly, the following tables are presented as being of use in this connection.

STRENGTH OF PURE BRINE CONTAINING SALT ONLY, TEMPERATURE 14 DEGREES CENTIGRADE OR 57·2 DEGREES FAHRENHEIT

Specific Gravity	*Twaddell Hydrometer*	*Per cent of Salt*	*Lb. of Salt Per Imperial Gallon*	*Expressed Per Gal. in lb. and oz.*	
				lb.	*oz.*
1·007	1·4	1	0·1007		1½
1·014	2·8	2	0·2028		3¼
1·021	4·2	3	0·3063		4¾+⅛F
1.028	5·6	4	0·4112		6½+⅛B
1·036	7·2	5	0·5180		8¼
1·043	8·6	6	0·6258		10
1·051	10·2	7	0·7357		11¾
1·058	11·6	8	0·8464		13½
1·065	13·0	9	0·9585		15¼
1·073	14·6	10	1·0700	1	1¼
1·080	16·0	11	1·1880	1	3
1·088	17·6	12	1·3056	1	4¾+⅛F
1·096	19·2	13	1·4248	1	6¾
1·103	20·6	14	1·5442	1	8¾
1·111	22·2	15	1·6665	1	10½+⅛
1·119	22·8	16	1·7904	1	12¾
1·127	25·4	17	1·9159	1	14½+⅛
1·135	27·0	18	2·0430	2	0¾
1·143	28·6	19	2·1717	2	2¾
1·151	30·2	20	2·3020	2	4¾+⅛
1·159	31·8	21	2·4339	2	7
1·167	33·4	22	2·5674	2	9+⅛
1·175	35·0	23	2·7025	2	11¼
1·184	36·8	24	2·8416	2	13½
1·192	38·4	25	2·9800	2	15¾
1·200	40·0	26	3·1200	3	2
1·204	40·9	26.395	3·1779	3	2¾+⅛

EXAMPLE S.G. 1·065 = 9 per cent = 0·9585 lb.
S.G. 1·200 = 26 per cent = 3·1200 lb.

SODIUM CHLORIDE (COMMON SALT)

SOLUBILITY OF NaCl IN PTS. H_2O AT t°

Temperatures		
°F.	*°C.*	*Pts. NaCl*
33·8	1	35·7
35·6	2	35·7
37·4	3	35·7
39·2	4	35·7
41·0	5	35·7
42·8	6	35·7
44·6	7	35·7
46·4	8	35·7
48·2	9	35·7
50·0	10	35·8
51·8	11	35·8
53·6	12	35·8
55·4	13	35·8
57·2	14	35·8
59·9	15	35·9
60·8	16	35·9
62·6	17	35·9
64·4	18	35·9
66·2	19	36·0
68·0	20	36·0
69·8	21	36·0
71·6	22	36·0
73·4	23	36·1
75·2	24	36·1
77·0	25	36·1
78·8	26	36·1
80·6	27	36·2
82·4	28	36·2
84·2	29	36·2
86·0	30	33·6
87·8	31	33·6
89·6	32	36·3
91·4	33	36·4
93·2	34	36·4
95·0	35	36·4
96·8	36	36·5
98·6	37	36·5
100·4	38	36·5
102·2	39	36·6
104·0	40	36·6
105·8	41	36·6
107·6	42	36·7
109·4	43	36·7
111·2	44	36·8
113·0	45	36·8
114·8	46	36·8
116·6	47	36·9
118·4	48	36·9
120·2	49	37·0
122·0	50	37·0
123·8	51	37·0
125·6	52	37·0
127·4	53	37·1
129·2	54	37·1
131·0	55	37·1
132·8	56	37·2
134·6	57	37·2
136·4	58	37·2
138·2	59	37·3
140·0	60	37·3
141·8	61	37·3
143·6	62	37·4
145·4	63	37·4
147·2	64	37·5
149·0	65	37·5
150·8	66	37·6
152·6	67	37·7
154·4	68	37·7
156·2	69	37·8
158·0	70	37·9
159·8	71	37·9
161·6	72	37·9
163·4	73	38·0
165·2	74	38·1
167·0	75	38·2
168·8	76	38·2
170·6	77	38·2
172·4	78	38·2
174·2	79	38·3
176·0	80	38·4
177·8	81	38·4
179·6	82	38·5
181·4	83	38·6
183·2	84	38·6
185·0	85	38·7
186·8	86	38·7
188·6	87	38·8
109·4	88	38·9
192·2	89	39·0
194·0	90	39·1
195·8	91	39·1
197·6	92	39·2
199·4	93	39·3
201·2	94	39·3
203·0	95	39·4
204·8	96	39·4
206·6	97	39·5
208·4	98	39·6
210·2	99	39·7
212·0	100	39·8
213·8	101	39·8
215·6	102	39·9
217·4	103	40·0
219·2	104	40·0
221·0	105	40·1

WEIGHT EQUIVALENTS

Ounce (oz.) = 28·35 grammes.
Pound (lb.) = 0·453 kilogram.
Quintal or central = 100 lb.
Ton (T) = 20 cwts. or 2,240 lb.

CAPACITY EQUIVALENTS

Pints		*Gallon*		*Peck*		*Bushel*		*Litres*
1	=	0·125	=	0·0625	=	0·01562	=	0·5676
8	=	1·0	=	0·5	=	0·125	=	4·541
16	=	2·0	=	1·0	=	0·25	=	9·082

WATER MEASURE WEIGHTS

Cubic Inch = 0·0361 lb.
Gallon = 10 lb.
Cubic Foot = 62·3210 lb. or 6·2321 gallons.
Ton = 224 gallons

CONVERSION TABLE

For Litres into Gallons and Quarts

Litres	=	Gallons and Quarts	
1	=	0	0·880
2	=	0	1·761
3	=	0	2·641
4	=	0	3·521
5	=	1 and	0·402
10	=	2 and	0·804
100	=	22 and	0·039

GAUGE PRESSURE AND PROCESSING TEMPERATURE RELATIONSHIPS AT VARIOUS ALTITUDES

The table shows the relationship between gauge pressure (pounds per sq. in. above atmospheric pressure) and temperature of saturated steam or boiling water at various altitudes.

Temperature		*Sea Level*	*Elevation—Feet above sea level*						
°*C.*	°*F.*		500	1,000	2,000	3,000	4,000	5,000	6,000
100·0	212	0·0	0·2	0·5	1·0	1·5	2·0	2·4	2·9
104·4	220	2·5	2·7	3·0	3·4	3·9	4·4	4·9	5·3
110·0	230	6·1	6·3	6·6	7·1	7·6	8·0	8·5	9·0
115·6	240	10·3	10·5	10·8	11·3	11·7	12·2	12·7	13·1
121·1	250	15·1	15·4	15·6	16·1	16·6	17·1	17·5	18·0
126·7	260	20·7	21·0	21·2	21·7	22·2	22·7	23·1	23·6

AVERAGE COMPOSITION OF VARIOUS SOUPS

	Total Solids Per cent	*Fat Per cent*	*Protein Per cent*	*Carbohydrate Per cent*	*Calories/ 100 g.*
Canned Vegetable Soups	13·8	0·9	2·0	9·1	53
Canned Meat Soups					
Kidney	11·8	1·9	2·9	5·6	51
Mulligatawny	12·5	3·0	2·5	5·2	58
Oxtail	11·3	1·9	2·6	5·0	48
Scotch Broth	12·1	1·6	2·8	6·4	51
Canned Cream Soups					
Cream of Celery	12·9	5·3	0·9	5·2	72
Cream of Green Pea	14·0	3·6	2·1	6·9	68
Cream of Tomato	16·9	3.6	1·0	10·5	79
Canned Clear Soups					
Chicken Consommé	6·0	—	4·2	0·5	19
Julienne	5·0	—	1·5	1·2	11

LIST OF CREDITS FOR FOOD MATERIALS

FLAVOR–MIST EMULSION FLAVOURS: W. J. Bush & Co. Ltd., Ash Grove, Hackney, E.8.

PROTEX Frederick Boehm Ltd., 19 Bentinck Street, London, W.1.

YEATEX The Trent Yeast Extract Co., Ltd., Shobnall Road, Burton-on-Trent.

SAROMEX Stafford Allen & Sons Ltd., 20 Wharf Road, London, N.1.

EDICOL Imperial Chemical Industries Ltd., London, S.W.1.

SOUP FLAVOUR IMPROVER: W. J. Bush & Co. Ltd., Ash Grove, Hackney, London, E.8.

SOYOLK Soya Foods Ltd., Colonial House, 30–34 Mincing Lane, London, E.C.3.

TRUSOY British Soya Products Ltd., 3 High Street, Puckeridge, Herts.

INDEX

Acids and alkalis, 118
Antioxidants, 120
Aseptic canning, 79
Asparagus soup, Canned cream of, 50

Bibliography, 161
Bone crushing for stock making, 8
Bones, Treatment for stock making, 6
Bottled soups, Retorting, 77
Brine Strength Table, 162
Broths, 84
Brown meat stock, 7
—— Windsor soup, canned, 58

Can handling, 68
—— seaming, 65, 66, 67, 68
Canning, 19, 24, 63
Catalase test for dried vegetables, 104
Celery soup, Canned cream of, 57
Cereal fillers or thickeners, 29
Chicken broth, Canned, 56
—— noodle soup mix, 131
—— soup, Canned cream of, 59
—— soup, Canned condensed cream of, 155
—— soup mix, Cream of, 136
Clarifying stock, 12
Clear soups, 84
Colloid mills, 22
Colourings, 118
Comminuting mill, 21
Composition of various soups (table), 165
Condensed soups, 150
Consumption of soups, 42
Corn soup, Canned cream of, 52
Cream soups, 83
Curdling prevention, 42

Dehydrated meat materials, 101
—— vegetables, 102
Disintegrators, 18
Dough Products, 36
Dry soup mixes, 98
—— Formulation, 128
—— Manufacture, 141
—— Raw materials, 100
—— Varieties available, 99
Drying plant, 103, 104, 105, 112, 113, 118, 131

Emulsification, 22
Evaporation plant, 121

Fat skimming and separation, 12
Fats for dry soup mixes, 119
Fillers or thickeners, 28
Filling machines, 25, 26, 27
Fish stock, 7, 9
Flavour, 2, 34, 115
Floor drainage, 19
Formulae, Commercial soup,
—— canned, 49
—— condensed, 151
—— dry soup mixes, 129
Future developments in the soup industry, 157

Herbs, 6, 9, 115
Homogenizer, 17
Hydrolysed protein, 36
Hydrostatic sterilizer, 75, 76

Improvers, Soup, 37
Isinglass, 13

KIDNEY soup,
—— canned, 60
—— mix, 132

LACQUERS for soup cans, 78
Legal aspects, 81
Lentil soup, Canned, 58

MEAT extract, use of, 4
Meat soups:
—— canned, 37, 59, 81
—— canned, condensed, 154
—— dry mix, 132
Milk products, 127
Minestrone soup, Canned, 61
Mock Turtle soup, Canned, 56
—— mix, 133
Monosodium glutamate, 15, 114, 126
Mulligatawny soup,
—— Canned, 55
—— dry mix, 130
Mushroom soup, Canned cream of, 57
—— mix, Cream of, 130

NOODLE extrusion presses, 147
Noodles for dry soup mixes, 146

ONION soup,
—— Canned cream of, 62
—— Canned French style, 53
—— dry mix, Cream of, 137
—— mix, French, 138
Oxtail soup,
—— Canned, 49
—— Canned condensed, 154
—— dry mix, 136

PEA soup,
—— Canned cream of green, 50
—— with Frankfurters, 52
Peroxidase test for dried vegetables, 104
pH, 42, 78
Pipe blanching unit, Continuous, 152
Pipe line cleansing and sterilizing, 16
Plant for soup making, 14
Processing, Soup canning and, 63
Protein derivatives, 36
—— products for dry soup mixes, 125
Pump for soup stock or soup, 10, 15

QUALITY control,
—— dry soup mixes, 144
—— function of, 27
Quick freezing plant, 88, 89, 90, 92, 93, 95
—— frozen soups, 1, 87

RESTAURANT kitchen soups, 3
Retorting, 72
—— bones for stock making, 6
Retorts, 16, 69, 70, 71, 73
Rotation agitation method, 80

SALT:
—— and flavourings, 113
—— solubility table, 163
Scotch broth, Canned, 51
Self-heating can for soups, 32
Sieving machine, 8, 17
SO_2 in dehydrated vegetables, Determination of, 108
Soup mixes, 1
Soya, use of, 30, 31, 32, 33
Spiced vinegars in soup making, 35
Spices, 6, 9, 115
Starches and thickeners, 109
Steam vapour removal, 19
Stock:
—— Basic bone, 5
—— definition of, 3
—— pot, 3, 4, 5
—— standardized, 4, 24
Sugars, 127
Sulphur dioxide in dried vegetables,
—— determination of, 108

THICKENERS, 30, 109
Tomato purée, 36, 41

Tomato purée, Standard for, 44
—— soup, Canned, 60
—— soup, Canned cream of, 54
—— soup, Canned condensed cream of, 151
—— soup mix, Cream of, 129
—— -Vegetable soup mix, 139

VARIETIES, 1, 43, 44
Vegetable chopping machine, 11
—— cutting machine, 12
Vegetable soups, canned, 40, 53, 83
—— soups, Canned condensed, 153
—— dry mixes, 129
—— stock, 7, 9
Votator processing unit for soup, 20

WHITE meat stock, 7, 9

YEAST extract, 36

USE

HI-SOY

FULL-FAT SOYA FLOUR

The ideal protein supplement for
increasing the

NUTRITIVE VALUE
and
GENERAL APPEAL

of many prepared foods

HI-SOY is specially processed to produce a fine flour with a pleasant bland flavour which retains the full exceptionally high nutritive value of the Soya bean.

PROTEIN	40% approx
OIL and PHOSPHATIDES ..	20% approx
SUGARS	10% approx

Send for free sample from:—

Arkady

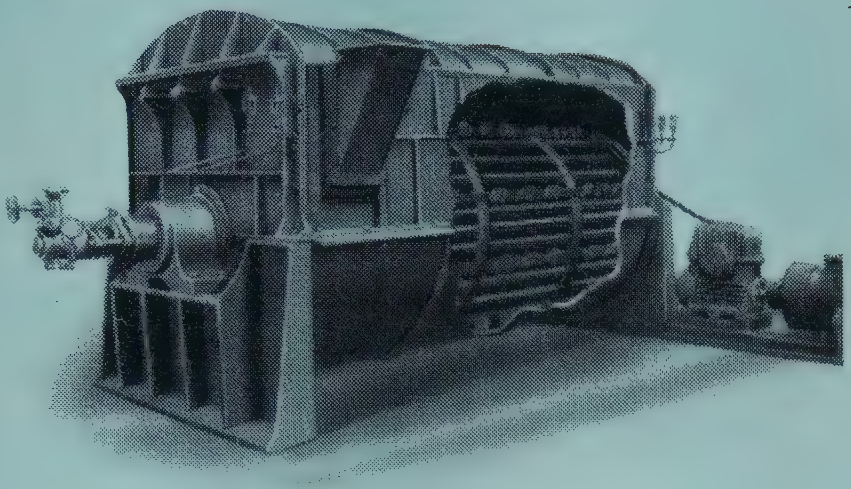
THE BRITISH ARKADY CO. LTD.
SKERTON ROAD · OLD TRAFFORD · MANCHESTER 16

Pioneers in Research and Service to the Food Industry

IMON PATENT

BULAR
RYER

the drying
Flour and
rch for use in
manufacture
Soups.

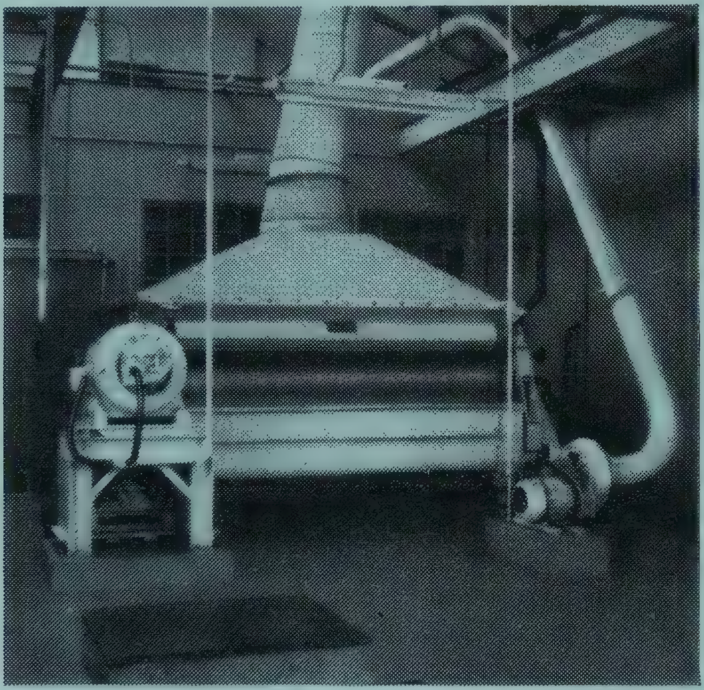


Drying is effected by a revolving reel of steam-heated tubes, the process being automatic and continuous.
20 different sizes in constant production.

IMON
TENT

LM
RYER

the drying of
k and
k Products



Test Plants of various types always available and we are only too pleased to carry out tests on customers' own materials, free of charge or engagement.

OKFARD' Continuous Pressure Cooker.
For pre-cooked packeted foods.

We have pleasure in announcing that we have been able to obtain the sole selling rights for these machines in Great Britain. We manufacture a wide range of automatic weighing machines for weighing in bulk, sacking-off, continuous weighing, etc.

CHARD SIMON & SONS, LIMITED
PHOENIX WORKS · BASFORD · NOTTINGHAM
Telephone: 75136-7-8 Telegrams: Balance Nottingham, England

2 good reasons

SAROMEX IS FLAVOUR STRENGTH STANDARDISED

All the spices and herbs in usual demand are immediately available such as:

BASIL
BAY
CARDAMOM
CASSIA
CAYENNE
CELERY
CINNAMON
CLOVE
CORIANDER
GARLIC
GINGER
MACE
MARJORAM
MINT
NUTMEG
ONION
PAPRIKA
PARSLEY
PEPPER
PIMENTO
ROSEMARY
SAGE
TARRAGON
THYME
SAUSAGE SEASONINGS
BEEF SEASONING
MIXED SPICE

CHANGE TO SAROMEX SEASONING NOW.
WRITE FOR SAMPLES TO:

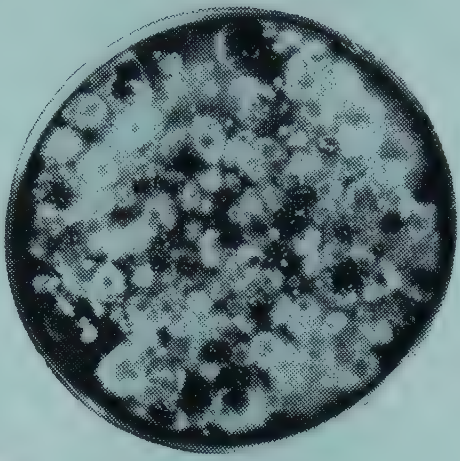
StaffordAllenS

STAFFORD ALLEN & SONS, LTD. Wharf Road, London, N.1

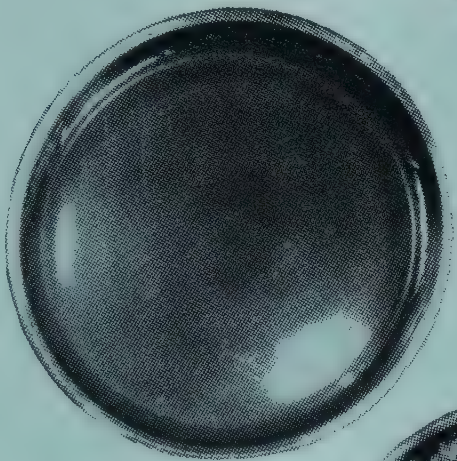
for using SAROMEX

SAROMEX IS FREE FROM MOULDS AND BACTERIA AND OTHER CONTAMINATION

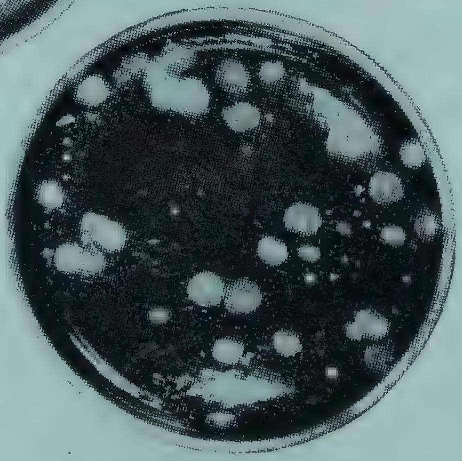
Photo Micrographs on right show fungal and bacterial contamination of natural ground Pepper compared with Saromex Pepper.



Top: *Fungal contamination of natural ground Pepper,* 0.05 *mg. material used, incubated at room temperature on a mould medium.*



Centre: *Negative result when using Saromex Pepper, both from the point of view of mould and fungi, using* 0.05 *mg. material.*

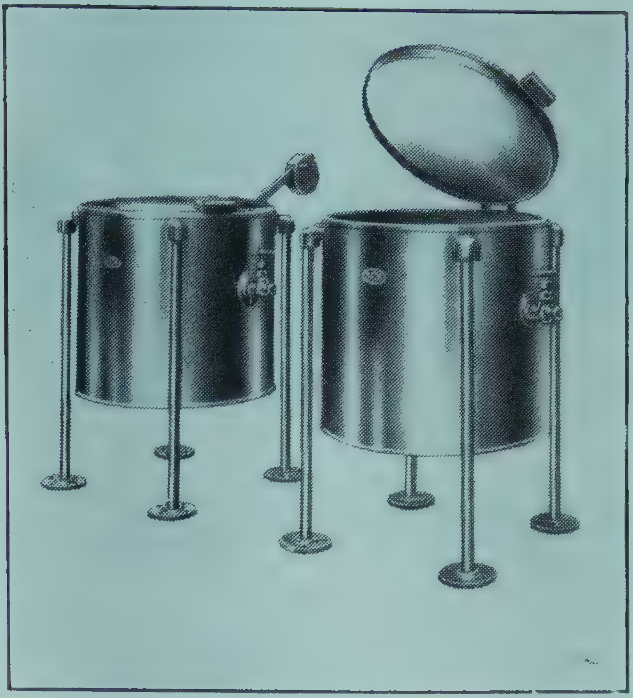


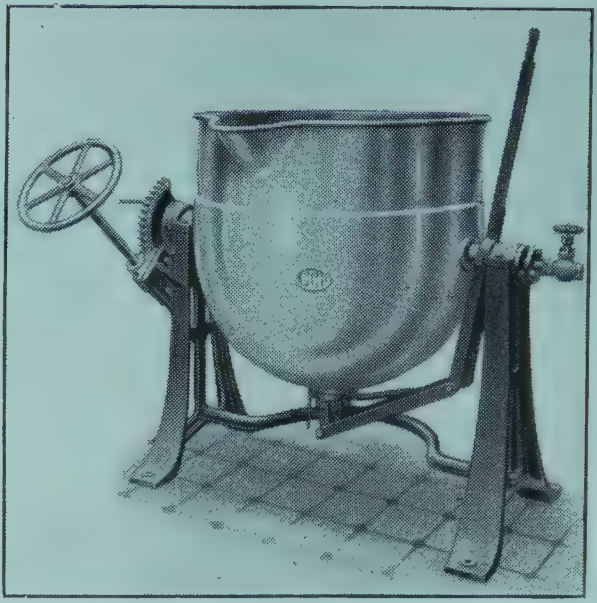
Bottom: *Bacterial contamination of natural ground Pepper,* 0.05 *mg. material used, incubated at room temperature.*

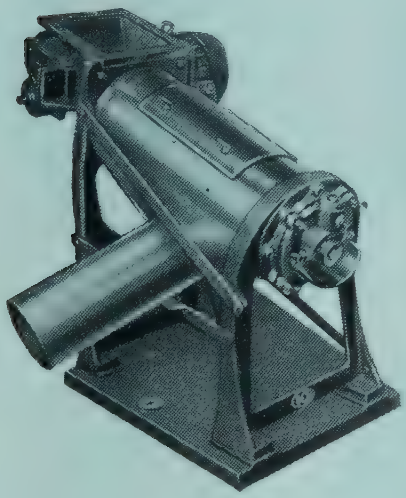
OTHER ADVANTAGES OF SAROMEX INCLUDE:

- ***Freedom from foreign matter, and speckiness***
- ***Free flowing and easy to handle***
- ***Prolongs Shelf Life of your product***

Telephone: CLErkenwell 1000. Grams: Stafalens, Nordo, London







VEGETABLE MACHINERY

WASHING
PEELING
DICING
MINCING
SIEVING
STIRRING

STAINLESS SOUP BOILING PANS—ALL TYPES & SIZES

ONION TOPPING, TAILING & PEELING MACHINES

CONSULT

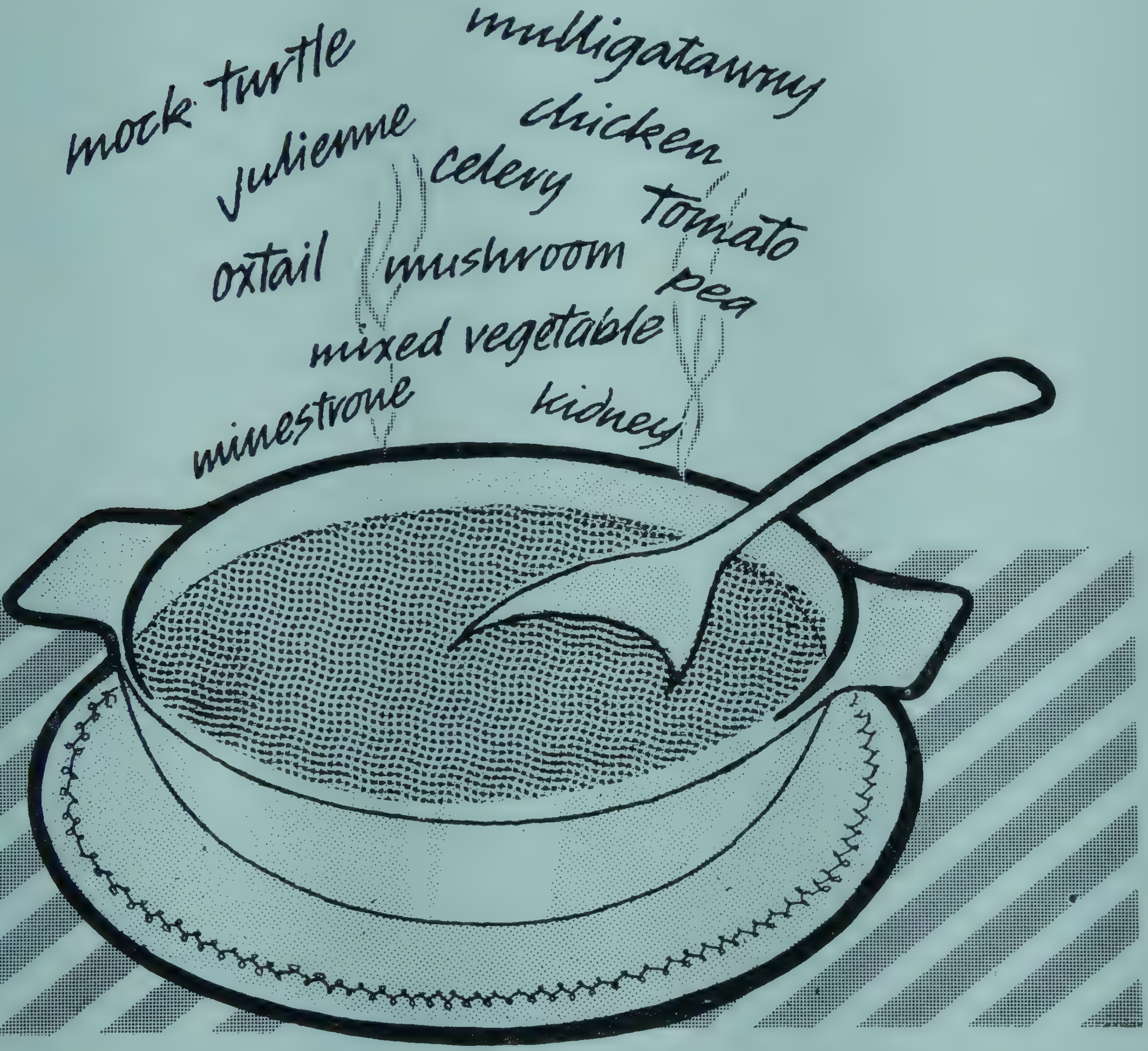
BCH

Wm. BRIERLEY, COLLIER & HARTLEY, LTD.

ROCHDALE, LANCS.

Flavours for soups

W. J. Bush offer a comprehensive range of flavouring compounds for use in canned soups, powdered soups and soup cubes. Prepared from carefully selected natural materials, our range of "FLAVOR-MIST" (Regd.) Soup Improvers will enhance the flavour and aroma of Soups of all kinds and add further distinction to their reputation. Flavours available in our range of Soup Improvers include:


mock turtle
mulligatawny
julienne
chicken
celery
tomato
oxtail
mushroom
pea
mixed vegetable
minestrone
kidney

Further details and samples are available on request from:

BUSH

W. J. BUSH & CO., LTD.

LONDON, E.8 · ENGLAND · Telephone: CLIssold 1234

PROTEX

HYDROLYSED PROTEIN

PROTEX hydrolysed proteins are manufactured in a range of pastes, powders and liquors and they contain optimum quantities of amino acids and naturally-formed salt.

PROTEX, when added to savoury foods of all kinds, improves the aroma and flavour of the food and adds "Appetite Appeal".

PROTEX confers on foodstuffs a meaty flavour which may be modified in richness by the skilful selection of different grades or blends of PROTEX.

The amino acids of PROTEX are of nutritional value also, apart from their flavour-enhancing properties, and they improve the quality of certain low-grade proteins.

Special grades of PROTEX can be made to customers' own requirements.

THE BOEHM EXPERIMENTAL KITCHEN is freely available to co-operate with you to solve a problem of one of your recipes or to prepare a recipe for you without cost or obligation. Most important of all, the service is CONFIDENTIAL.

FREDERICK BOEHM LIMITED
19 Bentinck Street, London, W.1. WELbeck: 7933

YEATEX

AUTOLYSED YEAST EXTRACT

YEATEX, a pure autolysed yeast extract, possesses a stimulating meaty flavour, free from the bitterness normally associated with other yeast products.

YEATEX, a sandwich spread in its own right, imparts a stimulating richness to all savoury foods, besides containing valuable amino acids and vitamins of the B complex.

YEATEX is available in two paste grades, one standardized to a minimum Vitamin B_2 content, and as a spray-dried powder.

AJI-NO-MOTO

MONOSODIUM GLUTAMATE (M.S.G.)

M.S.G. is a pure chemical compound with unique flavour-enhancing properties. It is, in fact, the sodium salt of glutamic acid, an amino acid occurring in most proteins.

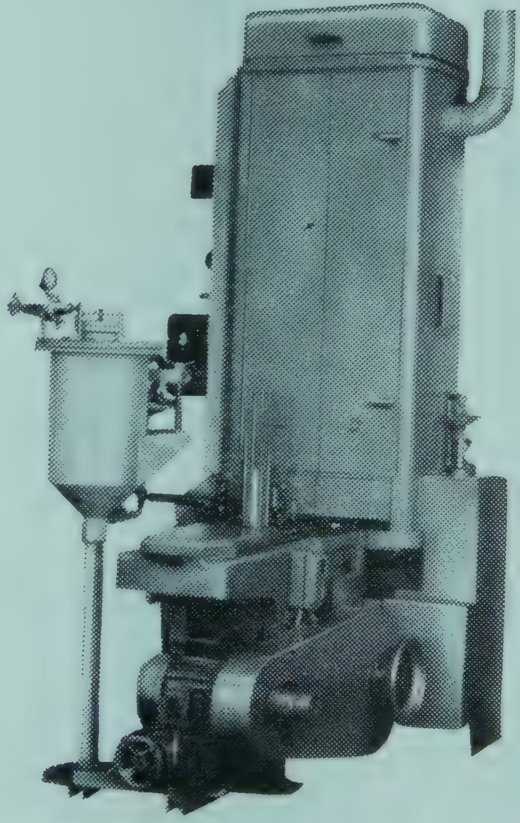
M.S.G. is virtually a "Super Seasoning" with practically no flavour of its own. M.S.G. stimulates the palate and brings out the flavour of all types of savoury foodstuffs.

M.S.G. is used by food processors for canned, quick-frozen, dehydrated and fresh-cooked products.

FREDERICK BOEHM LIMITED
19 Bentinck Street, London, W.1. WELbeck: 7933

DARBEX
Flowed-in
GASKETS

No. 17 HIGH SPEED CAN END LINING AND DRYING UNIT



DEWEY AND ALMY LTD
ELVEDEN ROAD, LONDON, N.W.10
ELGar 5671

Use BUTTERFLY BRAND Regd

PRINTED

GUMSTRIP REGD.

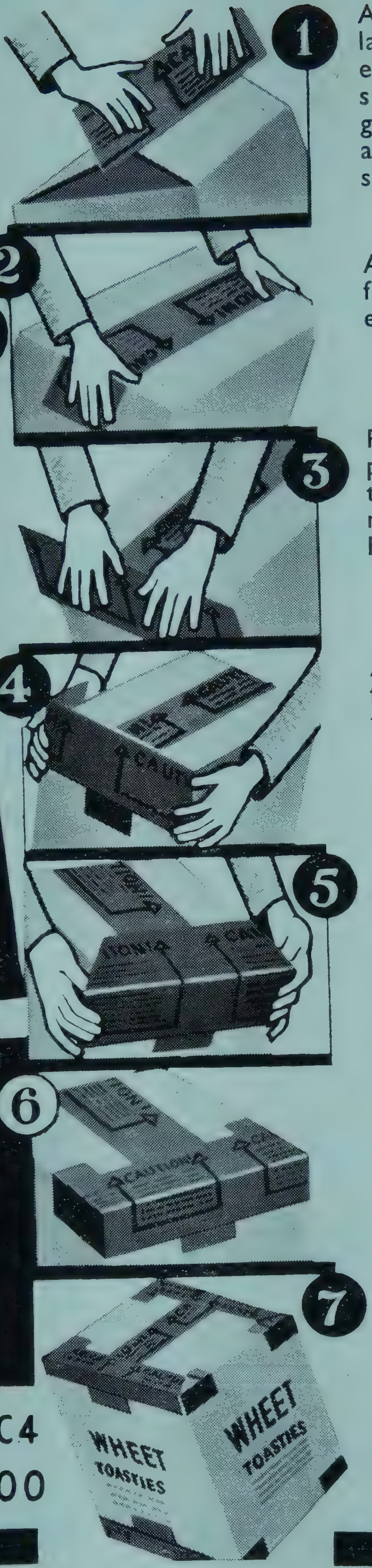
SEALING TAPE

for the

STANDARD
METHOD
of
CONTAINER
SEALING

Samuel
Jones
& CO. LTD.

NEW BRIDGE ST. LONDON. E.C4
PHONE: FLEet St. 6500



1 Allow 2″ overlap at both ends to ensure good grip and added strength.

2 Apply tape firmly and evenly.

3 Rub with palm of hand to ensure maximum adhesion.

4 Always work from middle to ends.

5 Fold tape under to protect and reinforce corners; this renders carton airtight and dust-proof.

6 It is advisable to protect scores even when flaps are glued.

7 Cartons packed with 'Butterfly Brand' Gumstrip Sealing Tape are secure and ready for transit from Lands End to John O' Groats.

PACKAGING SOUPS

When your requirement is a flexible packaging material – one that is functionally correct and designed to do a real selling job – then contact T.P.L., the manufacturers of the original British cellulose film.

Our complete service includes the manufacture of the material, original art work, printing and supplying as reels and bags to suit customers' requirements.

Transparent Paper Limited

Clearpack Limited

Halifax House 51-5 Strand London W C 2
Tel Trafalgar 4311 **Grams Transpaper Rand London**

40% Protein: 18% Fat: 2% Phosphatides (as Lecithin)
The original and best full fat processed Soya Flour

SOYOLK

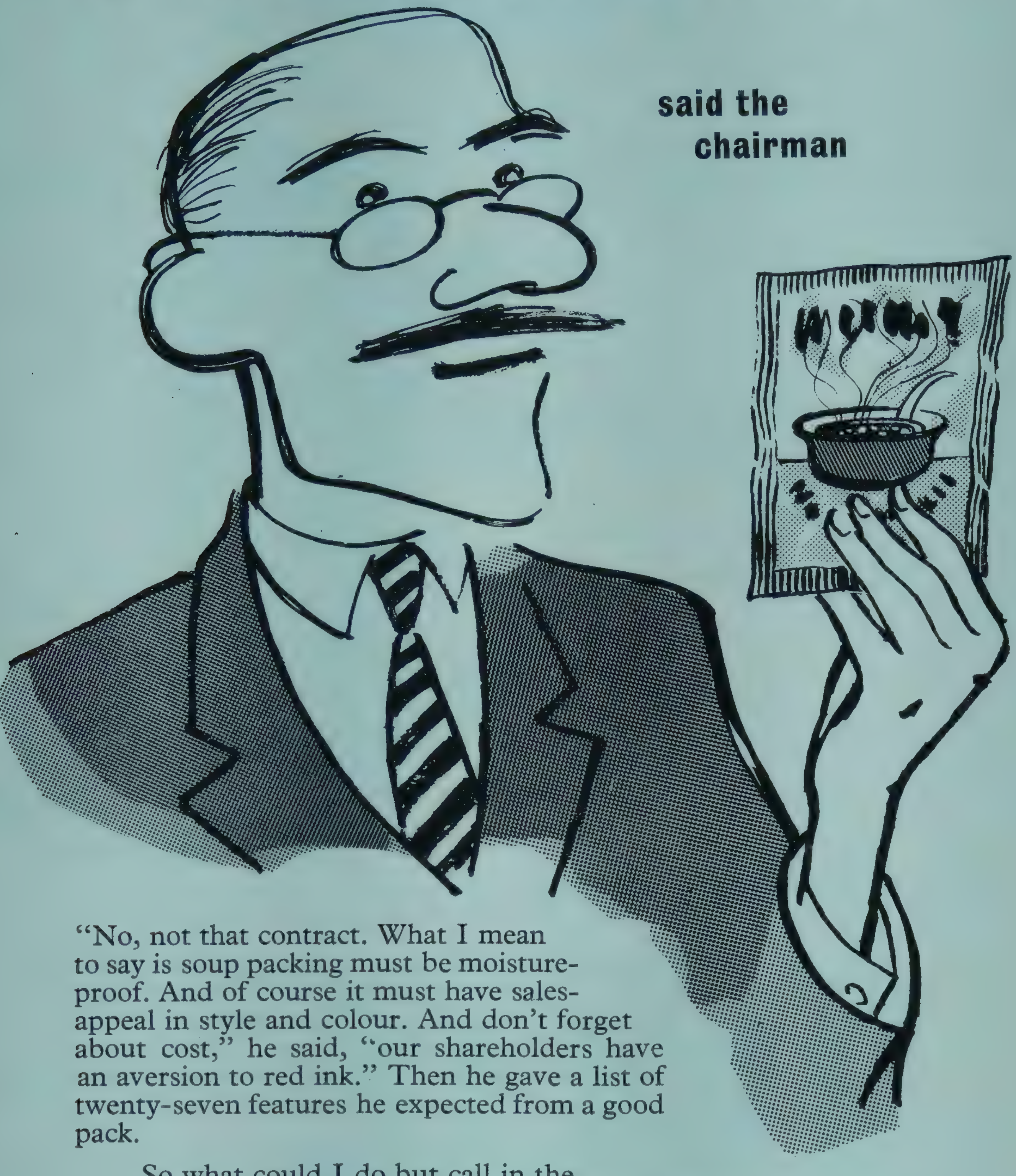
A first class natural stabiliser and emulsifier in food products

A "MUST" IN ALL "CREAM OF" TYPES OF CANNED & DRIED SOUPS

SOYA FOODS LTD., 30/34 Mincing Lane, London, E.C.3

"It must be WATERTIGHT"

said the
chairman



"No, not that contract. What I mean to say is soup packing must be moisture-proof. And of course it must have sales-appeal in style and colour. And don't forget about cost," he said, "our shareholders have an aversion to red ink." Then he gave a list of twenty-seven features he expected from a good pack.

So what could I do but call in the

IVERS-LEE CONTRACT PACKAGING SERVICE . . .

. . . their packs will even please *my* chairman.

Ideal for concentrated foods

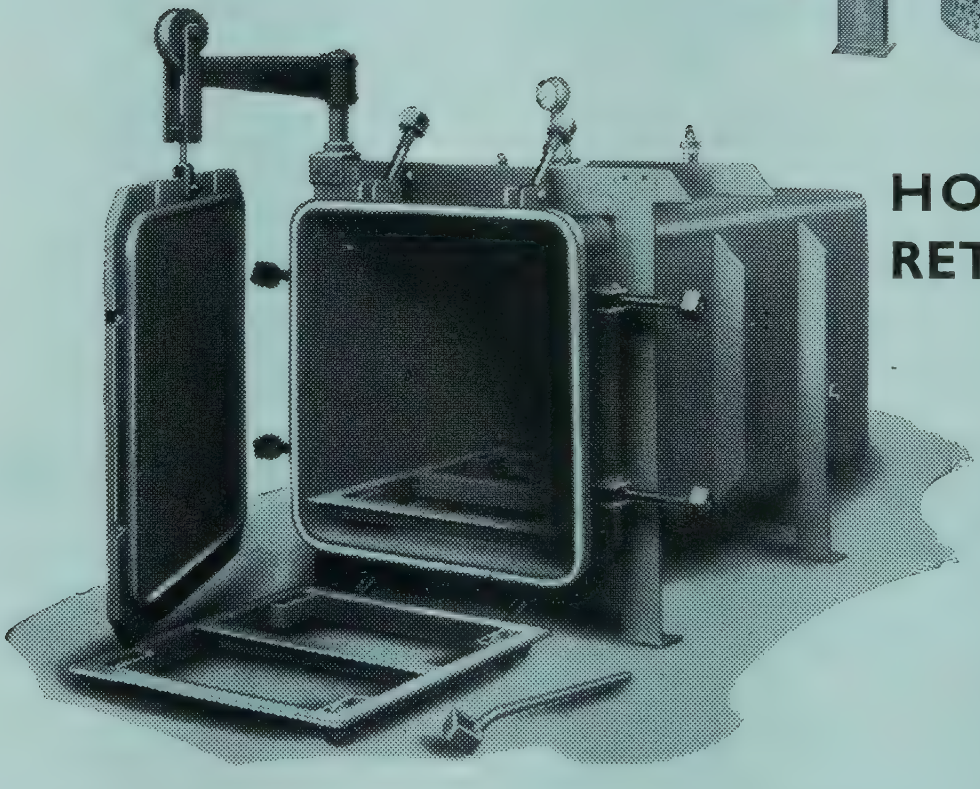
Flat-bag packaging by Ivers-Lee. Flat protective bags formed, filled and sealed at speed, untouched by hand. Bags may be formed of foil, laminated papers or transparent film left plain or printed in colour. Filled bags can be packed in cartons and dispatched from Ivers-Lee direct to wholesalers, etc. It's all part of the service.

For information, or if you wish to discuss your packaging problems with one of the Ivers-Lee Packaging Consultants, write to:

IVERS-LEE (GB) LTD. **225 BATH ROAD, SLOUGH, BUCKS**
Tel: SLOUGH 23971

"MILLWALL"

VERTICAL
RETORT



HORIZONTAL
RETORT

FOR ALL TYPES OF BATCH RETORTS CONSULT THE SPECIALISTS:

JOHN FRASER AND SON, LTD.
FERRY ST., MILLWALL, LONDON, E.14

TELEPHONE:
EAST 1185.

TELEGRAMS:
PRESVESALS, PHONE, LONDON

**WHATEVER YOUR REQUIREMENTS ARE
IN THE SPHERE OF**

DEHYDRATED VEGETABLES

AND

DEHYDRATED MEATS

OR

MUSHROOMS

(IN ALL SIZES AND FORMS)

OF DECISIVE SUPERIORITY

CONSULT :

DEMBY, HAMILTON & CO., LTD.

5 FENCHURCH ST., LONDON, E.C.3

Telephone: MANSION HOUSE 5106, 4271 & 0347

Telex 23873 BUCEPHALOS LONDON

***THE FIRM WITH 20 YEARS EXPERIENCE
IN THE FIELD OF DEHYDRATED PRODUCTS***

Other Books by Food Trade Press

PRACTICAL CANNING

by ARTHUR LOCK **Price £2-10-0** (by post **£2-12**

Starting a cannery; Cannery organization; Can sealing; Canning of fru Canning of apples and apple sauce; Fruit packs; Syrups; Fruit pulp a pulping; Jam canning; Fruit bottling, Retort operation; Canning vegetables.

QUICK-FROZEN FOODS

by JOHN L. ROGERS **Price £2-10-0** (by post **£2-12**

An entirely new book devoted to the Commerce and Technology of t fast growing Quick-frozen Foods Industry and of interest and value, only to those engaged in quick-freezing, but also to suppliers of raw mate and machinery for the industry.

Quick-freezing as a means of marketing; the function of the process wholesaler and retailer; technology of freezing and types of plant availab packaging and packaging machinery; processing of fruits, vegetables, fi meat, poultry, pre-cooked foods, and bakery products; uses of froz foods in home and in catering. 71 illustrations.

GELATINE DESSERTS AND TABLE JELLIES

by A. E. WILLIAMS, Ph.D., F.C.S. **Price £1-10-0** (by post **£1-11**

Chemistry of gelatine; Structure of gelatine solutions; Viscosity; Mar facture of gelatine; Testing of gelatine—Jelly strength; Viscosity te Acidity and *p*H; Moisture; Ash; Melting point; Sulphur dioxide; Colo Manufacture of table jellies—Processing; Flavours and Colours; Jelly pa Cooling and cutting; Jelly crystals; Jelly compounds; Gelatine capsul Examples of gelatine desserts. Non-gelatine gels; Fruit jellies.

MACARONI PRODUCTS—Manufacture, Processing & Packing

by DR. CHARLES HUMMEL. **Price £2** (by post **£2-1-**

This book covers the manufacture, processing and packing of all kinds macaroni products and the specialized machinery required. Printed art paper throughout, the book is profusely illustrated and the chapt titles are as follows: The Importance of Macaroni Products; Manufactu of Macaroni Products; Ingredients Used in the Manufacture of Macarc Products; Batch Manufacturing Process; Continuous Manufacturing Proce Some Typical Continuous Extrusion Presses; Drying Macaroni Produc The quality of Macaroni Products and How it can be Tested; Storing a Packing Macaroni Products.

A "COURSE" IN CANNING

by JOHN L. ROGERS. **Price £1** (by post **£1-1-**

Explaining the principles involved in the various processes and the meani of the technical terms used. Explains the basic principles of chemistr Elementary physics; What food is and what it does; Causes of foc spoilage; Commercial food processing; Preparation of food for cannin Blanching, filling and exhausting; Retorting, cooling and storage; Doub seaming; Quality control; Motion study; Foremanship.

FOOD TRADE PRESS LIMITED

7 Garrick Street, London, W.C.2.

Telegrams: RAYBIN, LESQUARE, LONDON. Cables: RAYBIN, LONDO

'TRUSOY'

the processed soya flour

'Trusoy', an entirely natural food astonishingly rich in protein and fat, will give you higher quality products with longer keeping qualities — and will reduce your production costs. Ask for test samples of 'Trusoy,' the processed Soya flour.

ANALYSIS

	%
Moisture	9.42
Protein	39.94
Oil	19.02
Phosphatides	1.90
Non-reducing sugars	10.33
Reducing sugars	Trace
Other carbohydrates (not starch)	13.14
Fibre	1.80
Ash	4.45
	100.00

BRITISH SOYA PRODUCTS LTD

3 High Street, Puckeridge, Hertfordshire
Telephone No: Puckeridge 291

Also manufacturers of 'SUPER BREDSOY', B.S.P. IMPROVER, 'GOLDCRUM', 'BUNKUM'.

EGG S B & M PRODUCTS

S. BEHR & MATHEW (SALES) LTD.

SPRAY DRIED WHOLE HEN EGG

Manufactured to S B & M Specification.

PASTEURISED EGG PRODUCTS

WHOLE EGG YOLK & ALBUMEN

FROZEN & DRIED EGG PRODUCTS

From all parts of the world.

PROCESSORS OF "Lion" BRAND FROZEN EGG

On behalf of THE BRITISH EGG MARKETING BOARD.

AGENTS FOR:

"SUNRISE" BRAND AUSTRALIAN FROZEN EGG
& WHITES.

HEAD OFFICE: 82 Borough High Street,
London, S.E.1 Tel: HOP 3372 (5 lines).

Wharfingers and Cold Store Proprietors

Branches: MANCHESTER · HAMBURG · PARIS

Checked by
K. N. Chandra Sekhar
16/8/61.

9.7.82

On
9/8/89

CHECKED

28-4-97

CHECKED
2008

VERIFIED
2013

C. F. T. R. I. LIBRARY, MYSORE.

Acc. No. 4602

Call No. F8,3Z39w N60

Please return this publication on or before the last DUE DATE stamped below to avoid incurring overdue charges.

Due Date	Return Date	Due Date	Return Date	Due Date	Return Date
5.12.90	21/11	28.10.2001	29.10.2001		
22.6.91	12.6.91	13/11/2001	13/11.		
~~7.4.95~~					
7.4.95	3.4.95	27-11-01	26/11/01		
22/8/91	23/8/91	05.02.14	4.2.14		
7/9/95	7/9/95				
29/9/95	21/9/95				
6.10.95	6.10.95				
21.10.95	5/11/95				
5/11/95	6.11.95				
21.11.95	20/11				
9/10/01	15/10/2001				

CFTRI-MYSORE
4602
Soup manufacture.

Acc. No. 4602
8,3Z z 9w
STED (R) N60
Tovnu